Stromberg-Carlson

601-B and 602-B Radio Receivers

REFERENCE BOOK

Printed in U. S. A.

Stromberg-Carlson

601-B and 602-B Radio Receivers

INSTRUCTIONS FOR INSTALLING AND OPERATING

Extra Copies Furnished at One Dollar Each

Stromberg-Carlson Telephone Mfg. Co.
ROCHESTER, N. Y., U. S. A.
Chicago, Illinois Kansas City, Mo. Toronto, Canada
P-15968, Form 2002 (7-20-26)

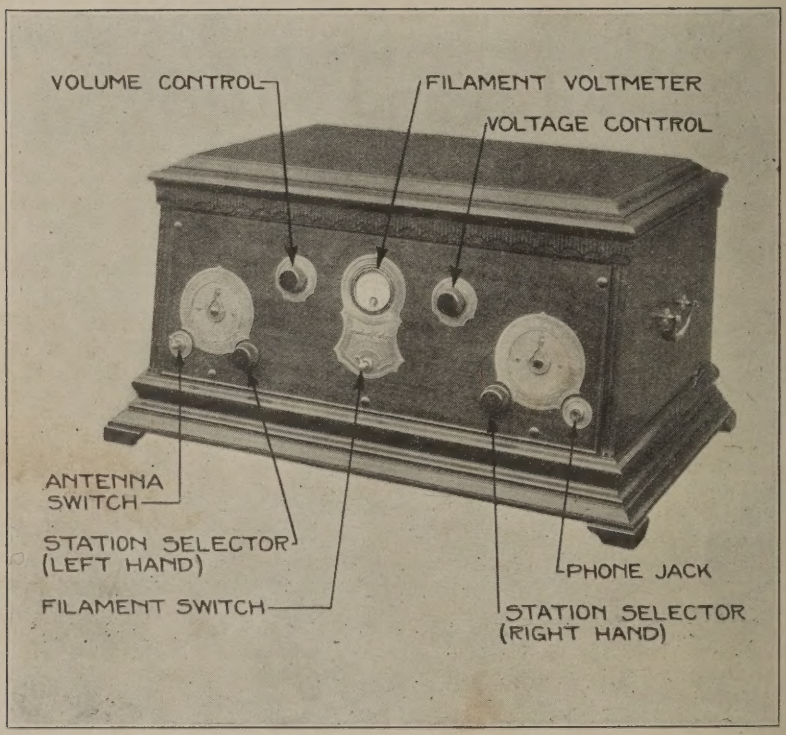


Fig. 1—Location of Controls for the No. 601-B "Treasure Chest" Radio Receiver. The same Controls are provided for the No. 602-B "Art Console" Receiver

§ 1—INTRODUCTION

This series of Stromberg-Carlson radio receivers has been designed to facilitate installation and provide unusual simplicity of operation, sensitivity and selectivity, and at the same time give an extremely natural reproduction in a high quality Cone type speaker.

These receivers also include a switch for allowing either an antenna or a loop type of signal collector to be used, as described in Sections 29 and 36, thus making these instruments practically universal in this application.

The operation is both simple and positive, the selection of the station with either antenna or loop being made by two independent selector controls, and by one volume control.

The fine tonal qualities of these receivers are not dependent on expert manipulation of the controls, in fact these receivers will not generate or radiate squeals or other oscillation noises and rich loud speaker reproduction will result up to the volume where the overloading limit of the tubes and speaker mechanism is reached.

The two radio receivers are known by the following code numbers:

No. 601-B Radio Receiver, Solid Mahogany "Treasure Chest" Cabinet, arranged for antenna or loop, but not including a loop. (See Fig. 1).

No. 602-B Radio Receiver, Walnut Floor Type "Art Console" Cabinet, with built-in compartment for batteries or socket-power current supply apparatus, arranged for antenna or loop, but not including a loop or a built-in speaker. (See Fig. 2.) A Stromberg-Carlson No. 5-A "Tip-top Table Type" Cone Speaker (See Section 47) is recommended for use with this receiver.

Each of these receivers contains the same design of chassis, employing three stages of totally shielded and neutralized radio-frequency amplification, a totally shielded detector system and two stages of high quality audio-frequency amplification. These chassis are provided with five-ply wood control panels, (front) finished to match the cabinets, that for the 601-B Receiver being selected mahogany and that for the No. 602-B Receiver being figured walnut. The radio amplifier is the licensed Neutrodyne type. (See Section 45).

In order to assist the expert installer as well as the novice in the correct handling of these receivers, this book has been divided, the first few pages being devoted to a condensed set of instructions for the expert and the remainder of the book to a complete detailed set of instructions for those not thoroughly acquainted with this type of receiver design.

Particular attention is called to the "Special Installing Precautions" in Section 44 of this book. Be sure to read these before operating the receiver. A list of Broadcasting Stations is given in Section 49.

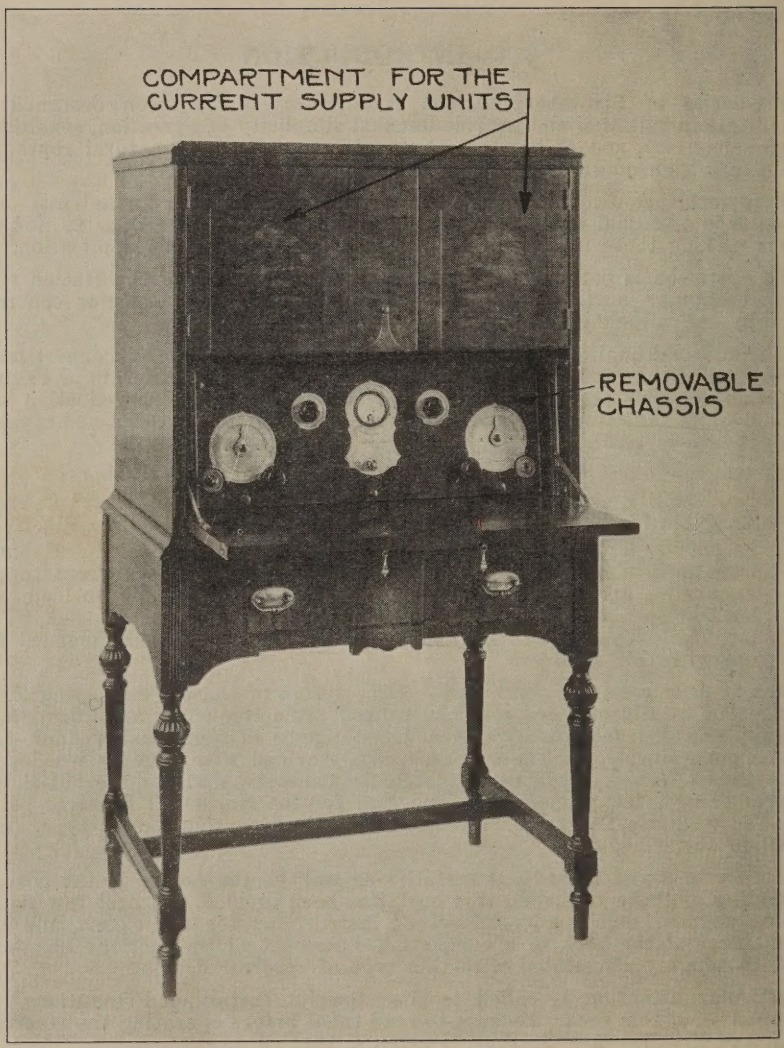


Fig. 2—No. 602-B "Art Console" Receiver with Drop Panel opened to show Controls. Designed for an External Cone Speaker, of the furniture type, the Stromberg-Carlson No. 5 "Tip-top Table" Cone Speaker (Fig. 54), being recommended for use with this Receiver

§ 2—PACKING LIST FOR NOS. 601-B AND 602-B RECEIVERS

Each packing box for the Stromberg-Carlson No. 601-B and No. 602-B Radio Receivers contains the following items:

1 Radio Receiver with calibration chart and wiring diagram attached to inside of cabinet.

1 P-16278 Battery Cable. Used for connecting the receiver to "A" and "B" batteries or socket power units.

5 P-16026 Jumper Wires (Black). Used for connecting 3 or 4 blocks of "B" batteries together and 2 or 3 blocks of "C" batteries together.

1 P-15970 Package assembly containing log cards and instruction book.

§ 3—LIST OF ACCESSORIES REQUIRED

Following are several lists of accessories, one of these lists of apparatus being required in addition to the No. 601-B or the No. 602-B radio receiver, to make a complete and efficient installation.

List No. 1—Storage "A" Battery, Dry Cell "B" Battery and UX-112 Power Tube. (See Section 16 for description, Fig. 3 for wiring diagram and Fig 25 for arrangement of apparatus).

1 Storage "A" Battery, 6 volts, 50-ampere hours capacity.

1 No. 2857 Tungar Rectifier (Insulated Type) 2 ampere size for charging the storage "A" battery from 60 cycle, 110-volt alternating current house lighting circuit (or equivalent charger of other make).

3 Dry Cell "B" Batteries, large size heavy duty vertical type of 45-volts each (Eveready No. 486, or equivalent).

2 Dry Cell "C" Batteries of 4½ volts each (Eveready No. 771, or equivalent).

5 Radiotron UX-201-A Tubes.

1 Radiotron UX-112 Tube.
(Be sure to obtain genuine R. C. A. Radiotron tubes of the "X" type.)

1 Stromberg-Carlson No. 5-A Cone Type Speaker, or equivalent. (See Section 47.)

1 Stromberg-Carlson No. 2 Antenna Outfit, or 1 Stromberg-Carlson No. 101-A Loop Equipment (See Section 36).

Note (a) The No. 602-B Receiver has built-in compartment for housing all power equipment. For a neat and serviceable installation of the No. 601-B Receiver, the Stromberg-Carlson No. 61 Radio Cabinet Table is recommended. It has ample space for all power equipment as shown in Fig. 10.

(b) If a 110-volt, 60 cycle alternating current lighting circuit is not available for charging purposes, a 6-volt, 100 or 150 ampere hour storage "A" battery is recommended as described under the heading "Filament or 'A' Current Supply" (Section 17).

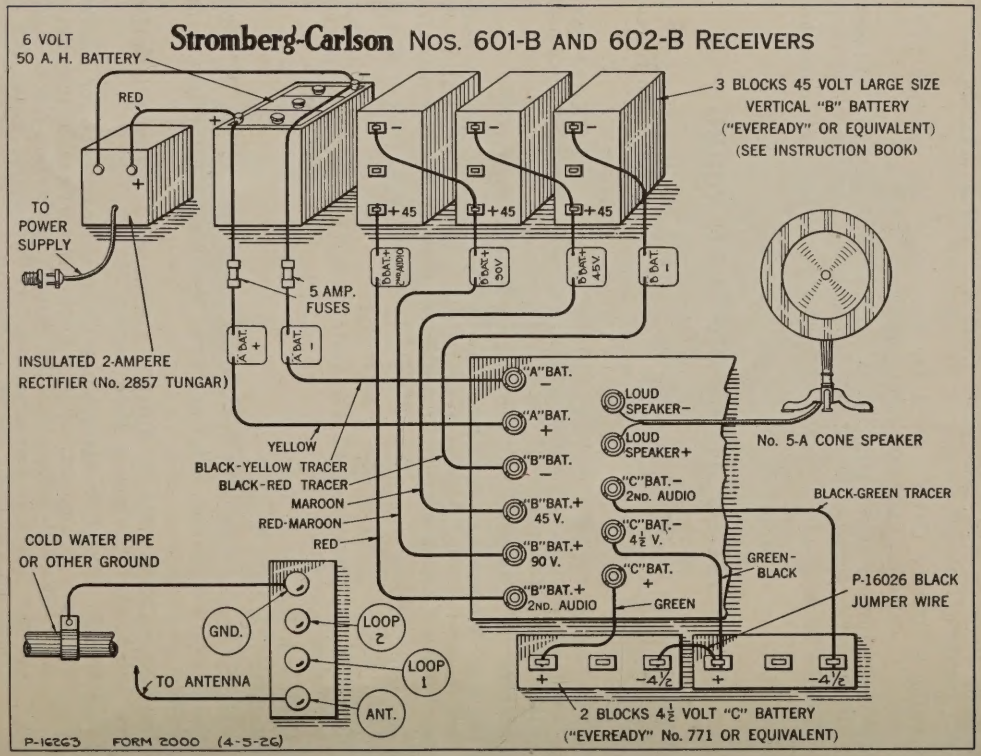


Fig. 3—External Connections for Storage "A" Battery and Dry Cell "B" Battery, when UX-112 Output Tube is used

List No. 2—Socket-Power "A," 135-volt Dry Cell "B" Battery and UX-112 Power Tube (See Section 16 for description, Fig. 4 for wiring diagram and Fig. 26 for arrangement of apparatus).

1 "A" Socket-Power Unit, consisting of a Trickle Charge 6-volt 40-ampere hour, Storage "A" Battery with a trickle charge rate of .4 to .8 amperes, arranged to operate from a 60 cycle, 110-volt alternating current house lighting circuit. (Gould AC-6 H.D. Unipower, or equivalent).

1 Stromberg-Carlson No. 301-A Power Switching Relay for automatically switching the "A" Socket-Power Unit. (See Section 21 and Fig. 23).

3 Dry Cell "B" Batteries, large size heavy duty vertical type of 45-volts each (Eveready No. 486 or equivalent).

2 Dry Cell "C" Batteries of 4½ volts each (Eveready No. 771 or equivalent).

5 Radiotron UX-201-A Tubes.

1 Radiotron UX-112 Tube.
(Be sure to obtain genuine R. C. A. Radiotron tubes of the "X" type).

1 Stromberg-Carlson No. 5-A Cone Type Speaker, or equivalent. (See Section 47.)

1 Stromberg-Carlson No. 2 Antenna Outfit, or 1 Stromberg-Carlson No. 101-A Loop Equipment (See Section 36).

Note—For a neat and serviceable installation of the No. 601-B Receiver the Stromberg-Carlson No. 61 Radio Cabinet Table is recommended. It has ample space for all power equipment as shown in Fig. 10.

List No. 3—Socket-Power "A," 180-volt Dry Cell "B" Battery and UX-112 Power Tubes (See Section 16 for description, Fig. 5 for wiring diagram and Fig. 27 for arrangement of apparatus).

1 "A" Socket-Power Unit, consisting of a Trickle Charge 6-volt 40-ampere hour, Storage "A" Battery with a trickle charge rate of .4 to .8 amperes, arranged to operate from a 60-cycle, 110-volt alternating current house lighting circuit. (Gould AC-6 H.D. Unipower, or equivalent.)

1 Stromberg-Carlson No. 301-A Power Switching Relay for automatically switching the "A" Socket-Power Unit. (See Section 21 and Fig. 23.)

4 Dry Cell "B" Batteries, large size heavy duty vertical type of 45 volts each (Eveready No. 486, or equivalent).

3 Dry Cell "C" Batteries of 4½ volts (Eveready No. 771, or equivalent).

5 Radiotron UX-201-A Tubes.

1 Radiotron UX-112 Tube.
(Be sure to obtain genuine R. C. A. Radiotron tubes of the "X" type).

1 Stromberg-Carlson No. 5-A Audio Output Transformer.

1 Stromberg-Carlson No. 5-A Cone Type Speaker or equivalent. (See Section 47.)

1 Stromberg Carlson No. 2 Antenna Outfit, or 1 Stromberg-Carlson No. 101-A Loop Equipment (See Section 36).

Note—For a neat and serviceable installation of the No. 601-B Receiver, the Stromberg-Carlson No. 61 Radio Cabinet Table is recommended. It has ample space for all power equipment as shown in Fig. 10.

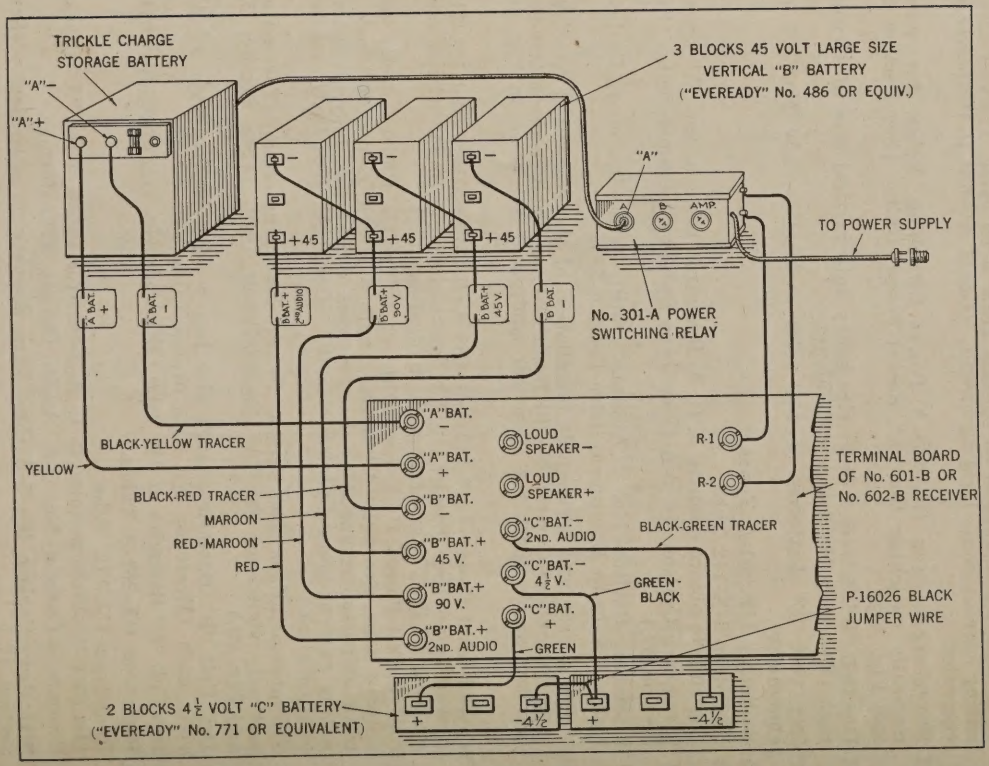


Fig. 4—External Connections for Socket-Power "A" and 135 volts of Dry Cell "B" Battery, when UX-112 Output Tube is used

List No. 4—Socket-Power "A," Socket-Power "B" and UX-112 Power Tube
(See Section 16 for description, Fig. 6 for wiring diagram and Fig. 28 for arrangement of apparatus).

1 "A" Socket-Power Unit, consisting of a trickle charge 6-volt 40-ampere hour Storage "A" Battery with a trickle charge rate of .4 to .8 amperes, arranged to operate from a 60-cycle, 110-volt alternating current house lighting circuit. (Gould AC-6 H.D. Unipower, or equivalent.)

1 Stromberg-Carlson No. 401-A "B" Socket-Power Unit to operate from 60-cycle, 110-volt alternating current house lighting circuit and provide 45-volt, 90-volt, and 135-volt taps (or equivalent "B" Socket-Power of other make) See Section 18.

1 Stromberg-Carlson No. 301-A Power Switching Relay for automatically switching the "A" and "B" Socket-Power Unit. See Section 21 and Fig. 23.

2 Dry Cell "C" Batteries of 4½ volts each (Eveready No. 771 or equivalent).

5 Radiotron UX-201-A Tubes.

1 Radiotron UX-112 Tube.
(Be sure to obtain genuine R. C. A. Radiotron tubes of the "X" type).

1 Stromberg-Carlson No. 5-A Cone Type Speaker or equivalent. (See Section 47.)

1 Stromberg-Carlson No. 2 Antenna Outfit, or 1 Stromberg-Carlson No. 101-A Loop Equipment (See Section 36).

Note—For a neat and serviceable installation of the No. 601-B Receiver, the Stromberg-Carlson No. 61 Radio Cabinet Table is recommended. It has ample space for all power equipment as shown in Fig. 10.

List No. 5—Socket-Power "A," Socket-Power "B" and UX-171 Power Tube
(See Section 16 for description, Fig. 7 for wiring diagram and Fig. 29 for arrangement of apparatus.)

1 "A" Socket-Power Unit, consisting of a Trickle Charge 6-volt 40-ampere hour Storage "A" Battery with a trickle charge rate of .4 to .8 amperes arranged to operate from a 60 cycle, 110 volt alternating current house lighting circuit. (Gould AC-6 H.D. Unipower, or equivalent).

1 Stromberg-Carlson No. 401-A "B" Socket-Power Unit to operate from 60 cycle, 110 volt alternating current house lighting circuit and provide 45 volt, 90 volt, and 135 volt taps (or equivalent "B" socket-power unit of other make). See Section 18.

1 Stromberg-Carlson No. 301-A Power Switching Relay for automatically switching the "A" and "B" socket power units. See Section 21 and Fig. 23.

1 Dry Cell "C" Battery 4½ volts (Eveready No. 771 or equivalent).

1 Dry Cell "C" Battery 22½ volts (Eveready No. 768 or equivalent).

5 Radiotron UX-201-A Tubes.

1 Radiotron UX-171 Tube.
(Be sure to obtain genuine R. C. A. Radiotron tubes of the "X" type).

1 Stromberg-Carlson No. 5-A Audio Output Transformer.

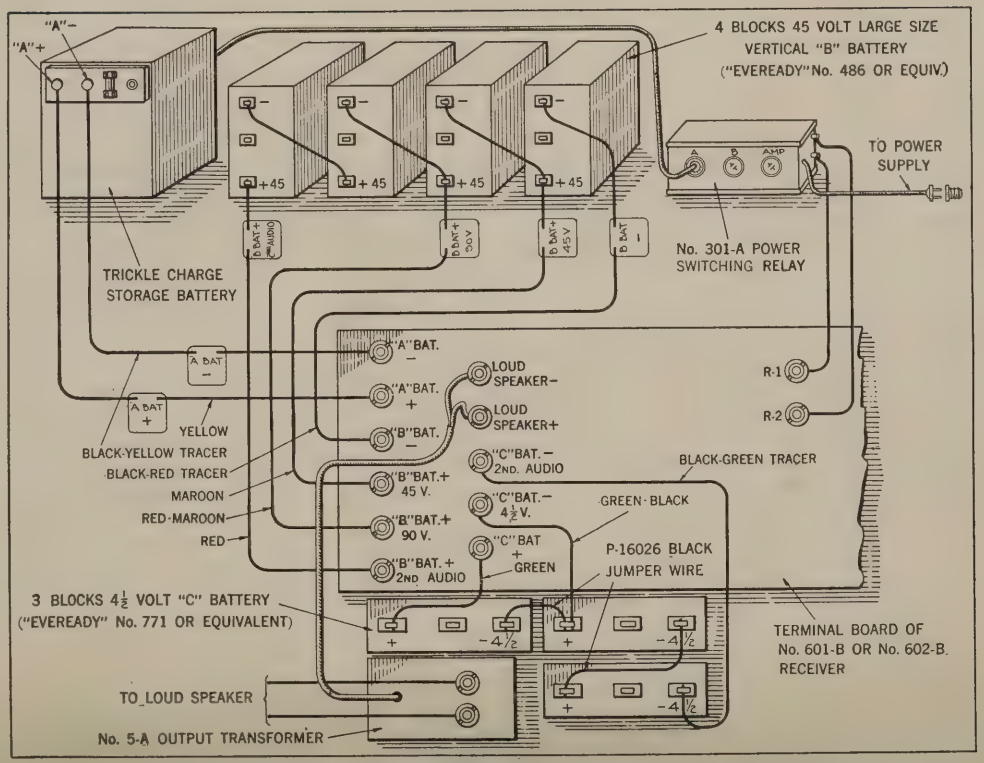


Fig. 5—External Connections for Socket-Power "A" and 180 volts of Dry Cell "B" Battery, when UX-112 Output Tube is used

1 Stromberg-Carlson No. 5-A Cone Type Speaker or equivalent. (See Section 47.)

1 Stromberg-Carlson No. 2 Antenna Outfit, or 1 Stromberg-Carlson No. 101-A Loop Equipment (See Section 36).

Note—For a neat and serviceable installation of the No. 601-B Receiver, the Stromberg-Carlson No. 61 Radio Cabinet Table is recommended. It has ample space for all power equipment as shown in Fig. 10.

List No. 6—Socket-Power "A" and "B" with External Power Amplifier (See Article 16 for description, Fig. 8 for wiring diagram and Fig. 30 for arrangement of apparatus).

1 "A" Socket-Power Unit, consisting of a Trickle Charge 6-volt, 40-ampere hour Storage "A" Battery unit with a trickle charge rate of .4 to .8 amperes arranged to operate from a 60 cycle, 110 volt alternating current house lighting circuit. (Gould AC-6 H.D. Unipower, or equivalent).

1 Stromberg-Carlson No. 401-A "B" Socket-Power Unit to operate from 60 cycle, 110 volt alternating current house lighting circuit and provide 45 volt, 90 volt, and 135 volt taps (or equivalent "B" socket-power unit of other make). See Section 18.

1 Stromberg-Carlson No. 301-A Power Switching Relay for automatically switching the "A" and "B" socket-power units and operating current for the External Power Amplifier. See Section 21 and Fig. 23.

1 Dry Cell "C" Battery of 4½ volts (Eveready No. 771 or equivalent).

5 Radiotron UX-201-A Tubes.
(Be sure to obtain genuine R. C. A. Radiotron tubes of the "X" type).

1 External Super-Power Amplifier with combined current supply to operate from a 60 cycle, 110 volt alternating current house lighting circuit. (Western Electric No. 6025-B Amplifier or R. C. A. Uni-Rectron Power Amplifier Model AP-935) See Section 20.

1 Stromberg-Carlson No. 5-A Cone Type Speaker or equivalent. (See Section 47.)

1 Stromberg Carlson No. 2 Antenna Outfit, or 1 Stromberg-Carlson No. 101-A Loop Equipment (See Section 36).

Note—For a neat and serviceable installation of the No. 601-B Receiver, the Stromberg-Carlson No. 61 Radio Cabinet Table is recommended. It has ample space for all power equipment as shown in Fig. 10.

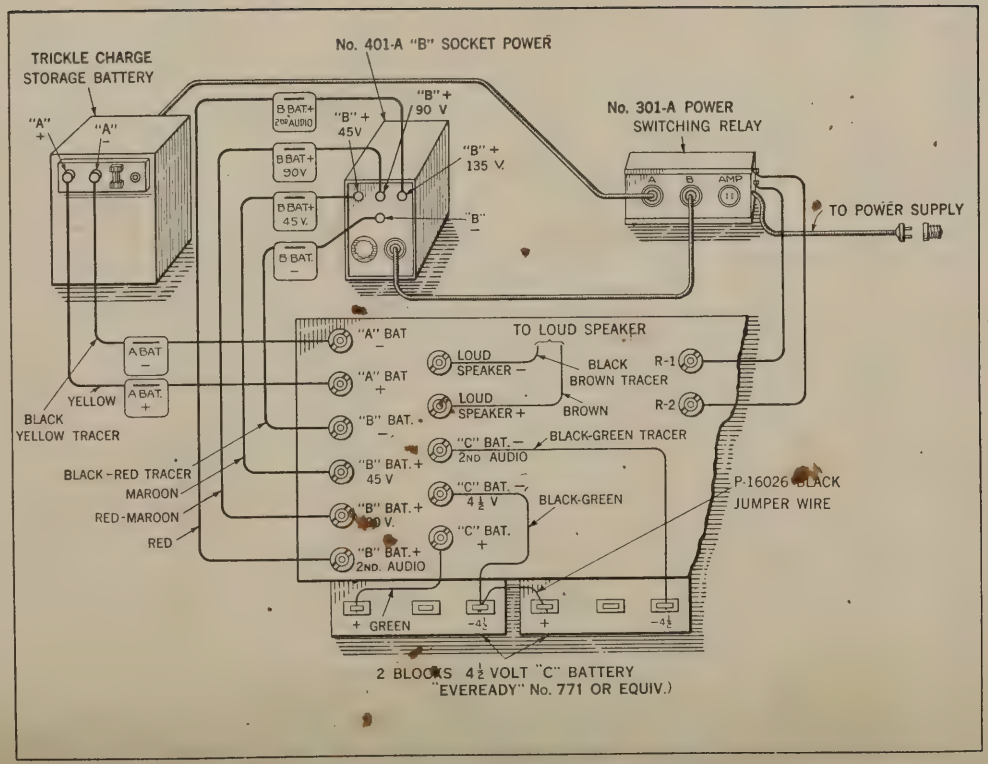


Fig. 6—External Connections for "A" and "B" Socket-Power Units, when UX-112 Output Tube is used

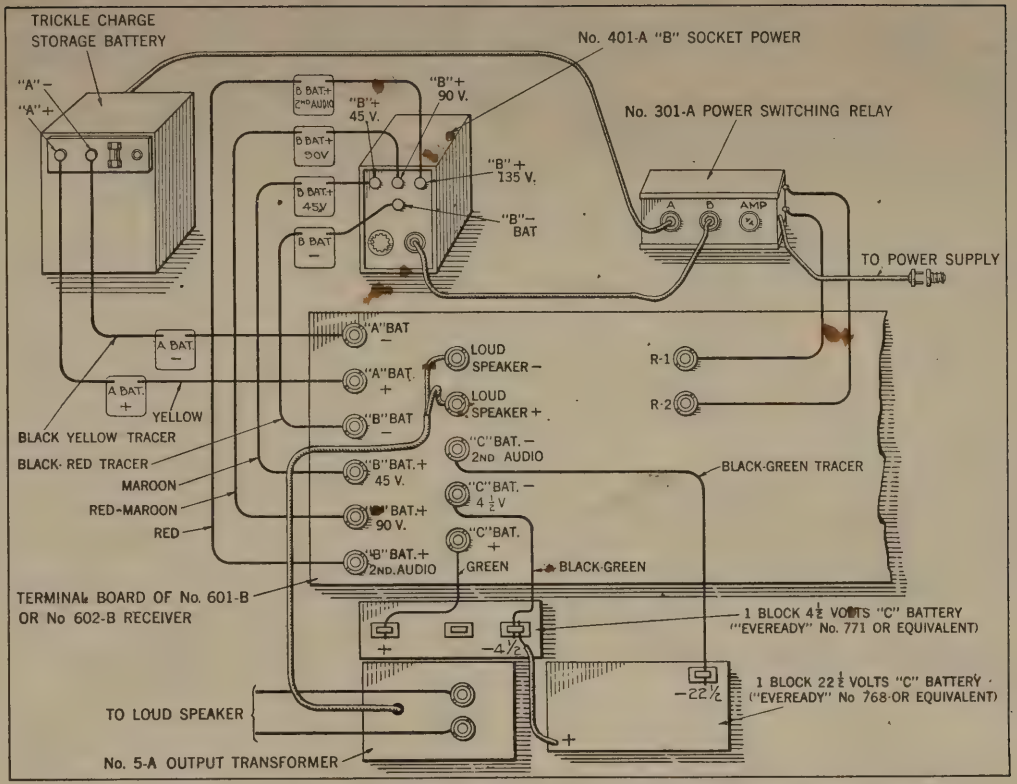


Fig. 7—External Connections for "A" and "B" Socket-Power Units, when UX-171 Output Tube is used

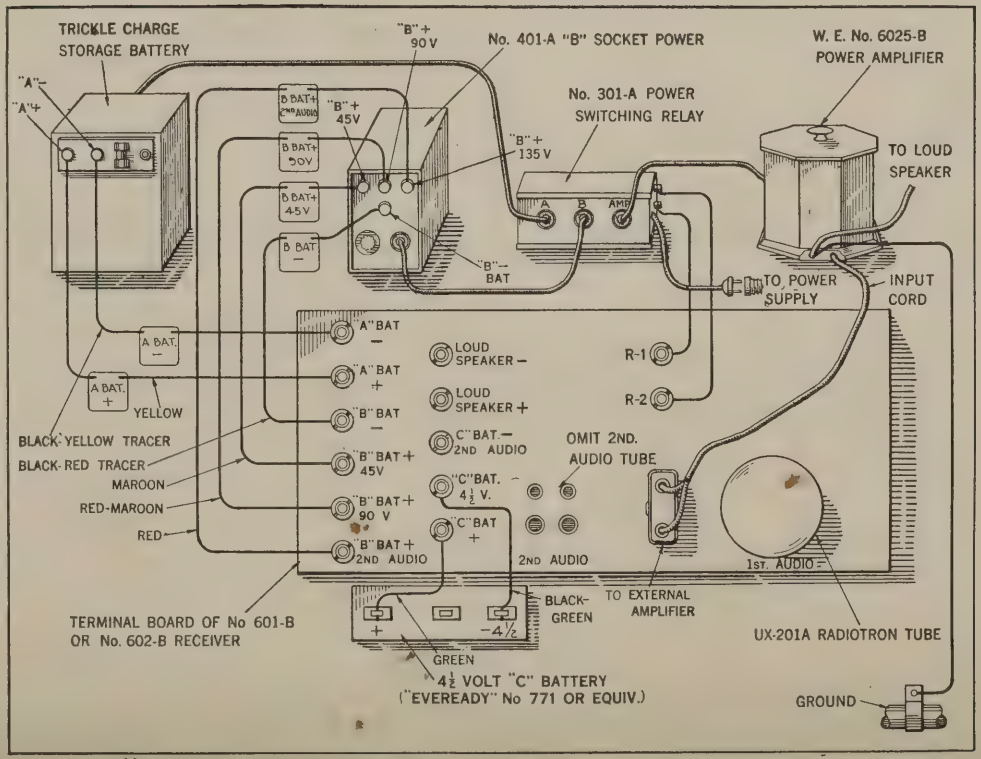


Fig. 8—External Connections for "A" and "B" Socket-Power Units, when an External Power Amplifier is used

§ 4—CONDENSED INSTRUCTIONS FOR INSTALLATION AND OPERATION

First—Select the accessories required for a complete installation from one of the foregoing lists, being sure that the vacuum tubes will operate efficiently and that all batteries are fresh or fully charged and that the socket-power units, if used, have been previously tested for efficient operation.

Second—The Loud Speaker should be permanently wired to the binding posts provided on the terminal board of the chassis as shown in Fig. 3. If the speaker is of the Cone type, it can be connected without paying attention to the polarity. However, if a horn type of speaker is employed, such as the Stromberg-Carlson No. 2-A, the solid "Brown" covered wire (in some cases the wire with a red thread tracer) should go to the binding post marked "+ LOUD SPEAKER," the other conductor going to the post marked "— LOUD SPEAKER." If an external power amplifier is employed as in Accessory List No. 6, then the input of the amplifier should be plugged into the terminal board jack marked "EXTERNAL AMPLIFIER" as shown in Fig. 8.

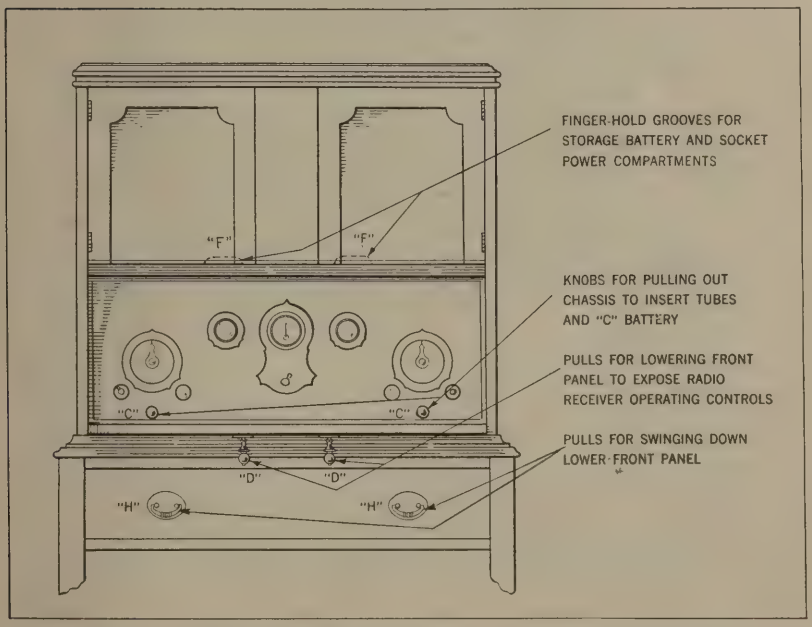


Fig. 9—Front View of No. 602-B Receiver Cabinet showing accessibility provided by having all Compartments open from the front

Third—The batteries or socket-power units should be located in the battery compartment tray, provided in the No. 602-B receiver cabinet, Figs. 9 and 34, or in the battery space provided in the No. 61 Radio Table, Fig. 10, when the latter is used. The connections to these batteries or socket-power equipment should be made through the connecting cable (Section 15) provided for this purpose. See Figs. 3 to 8, inclusive, for wiring diagrams covering the various arrangements of power equipment recommended.

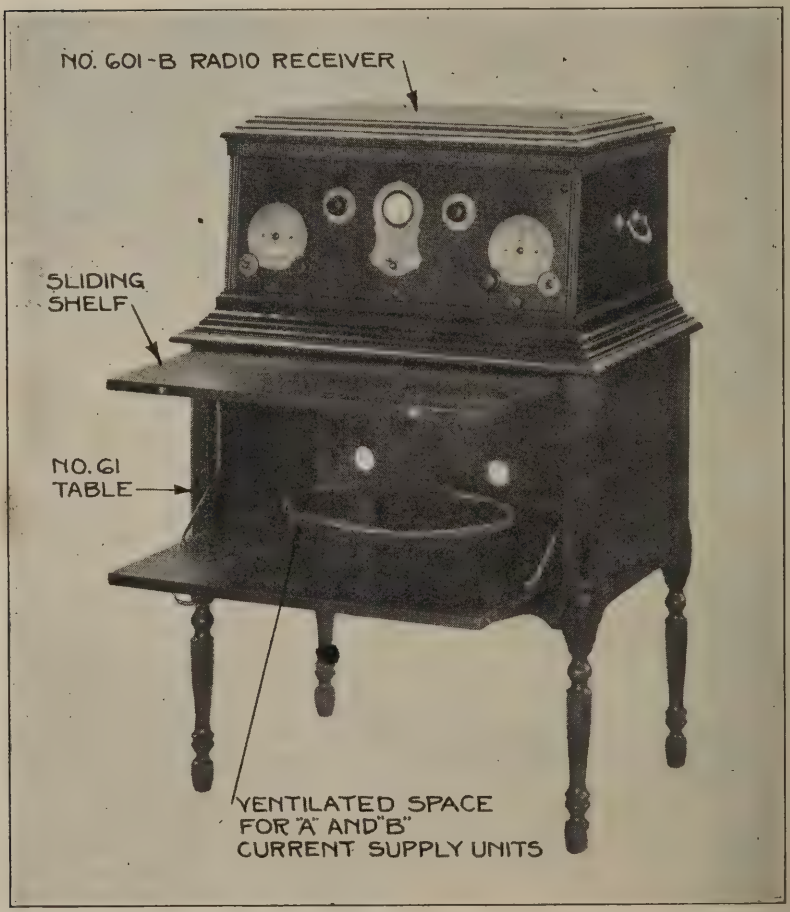


Fig. 10—No. 601-B Receiver Mounted on the No. 61 Radio Cabinet Table, showing convenience of Front-Opening Compartment for Current Supply Apparatus

Fourth—In all cases, the three radio amplifier stages, the detector and the 1st audio stage should be fitted with Radiotron UX-201-A Tubes. The 2nd audio stage requires a UX-112 Tube if one of the Accessory Lists Nos. 1, 2, 3 or 4, is chosen; UX-171 Tube if Accessory List No. 5 is chosen; and no tube if Accessory List No. 6 is chosen. The location of the sockets for these tubes is shown in Fig. 11. Before inserting any of the tubes, be sure that the batteries or socket power units are properly connected as shown in the wiring diagrams.

Fifth—The antenna and ground wires, or the connecting cable of the Stromberg-Carlson No. 101-A Loop, should be brought into the radio cabinet through the large hole "T," shown in Figs. 12 and 13. The antenna wire should be connected to the binding post marked "ANT" and the ground or counter-poise wire (See Section 35) to the binding post marked "GND" as shown in Fig. 3. If a loop is used, its connecting cable is attached as follows: (See Fig. 48).

Black wire to binding post marked "GND."
Blue-Black wire to post marked "LOOP-2."
Blue wire to binding post marked "LOOP-1."

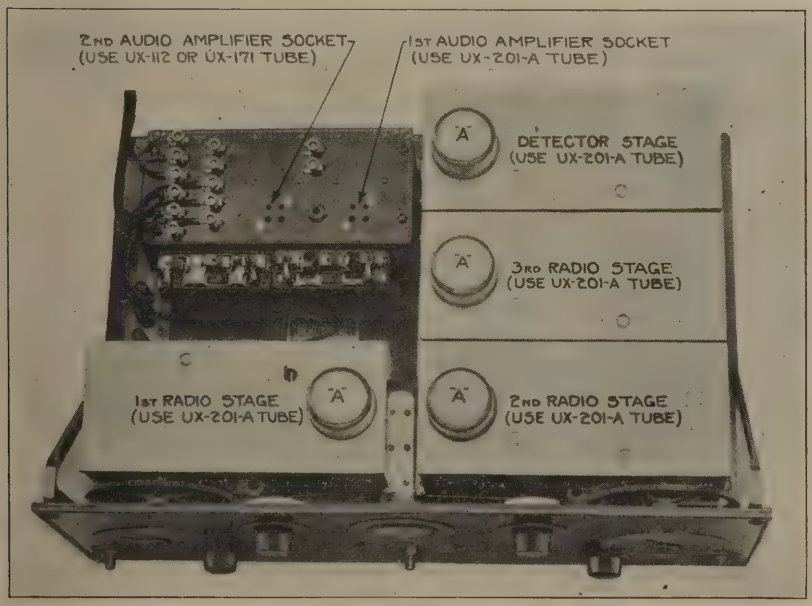


Fig. 11—Top View of Chassis showing location for Vacuum Tubes

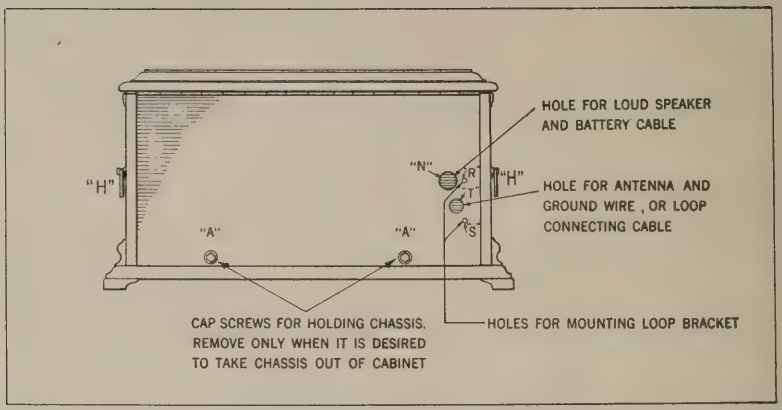


Fig. 12—Rear of No. 601-B Cabinet, Showing Chassis Holding Cap Screws and Openings for external Circuit Wiring

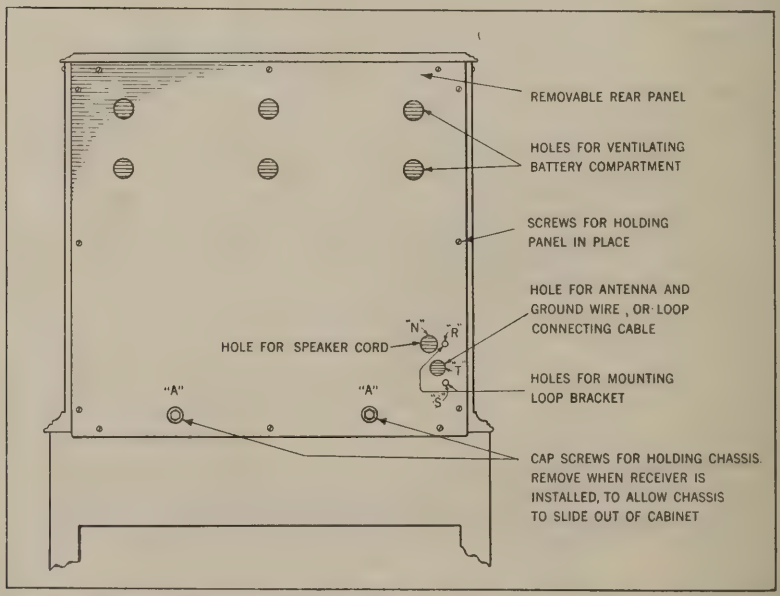


Fig. 13—Rear of No. 602-B Cabinet, showing Chassis Holding Cap Screws and Openings for external Wiring and for Ventilation

Sixth—To operate the receiver, turn the battery switch to "ON" and the knob marked "VOLUME" to its minimum position (as far as possible counter-clockwise). Then adjust the knob marked "VOLTAGE" to a position where the voltmeter pointer is at or slightly to the left of the red line, indicating five volts. Now, before attempting to tune-in a station, turn the "VOLUME" knob to a maximum, in the direction of the arrow on the escutcheon. These controls are shown in Fig. 1.

Seventh—When a wire antenna is used see that the switch in the top of the first radio stage is **pushed in so that only the letter "A" is visible,** as shown in Fig. 50. If a loop is used, pull the switch up as far as it will go as shown in Fig. 49. The letter "L" is visible when this position is obtained. Furthermore, when a loop is used, it must be remembered that it is necessary to revolve the loop to the proper position to obtain the maximum signal strength from each station. (See Section 37.)

Eighth—Taking the wave length of a local or powerful station that is broadcasting, locate its tuning position on the right hand STATION SELECTOR by means of the calibration chart, Fig. 20. (This chart is located on the inside and at the back of the No. 601-B receiver cabinet and inside the upper right hand door of the No. 602-B receiver cabinet). Set the right hand STATION SELECTOR at this reading and then move the left hand STATION SELECTOR forward and backward about ten divisions above and below the setting of the other selector, until the station is located, slightly re-adjusting both selectors to get maximum response of signal for each selector. This maximum response can best be obtained by **keeping the control marked "VOLUME" turned down** while "sharpening" the tuning. Now, the "VOLUME" control can be turned up to obtain the desired strength of signal in the loud speaker. In no case should this VOLUME control be turned up to a point where the detector or 2nd audio tube is overloaded, as bad distortion results.

Ninth—After one station is located, others may be found, either by means of the calibration chart in the same manner described in "Eighth" paragraph or by moving both STATION SELECTORS approximately the same amount with a slight re-adjustment of both selectors to get maximum response when the station is picked up in order to insure good reproduction.
When first operating the receiver, it is well to list several of the stations on the log card, Fig. 22, by means of the calibration chart, after which stations can be easily picked up and logged. Section 49 of this book gives a partial list of Broadcasting Stations with spaces to log STATION SELECTOR settings.

§ 5—UNPACKING AND SETTING UP OF NO. 601-B RECEIVER

The Stromberg-Carlson No. 601-B radio receiver is carefully packed in a cushioned inner box with a wooden reinforcement outside. The only precaution in unpacking is to take care not to scratch or mar the cabinet finish. Removing the two end packing "cushions" will allow the reciver to be easily raised out of the packing box by means of the two end handles shown at "H" in Fig. 12.

Carefully preserve this packing material for future use, if for any reason, it is desired to re-ship this receiver.

Finger marks or dust on the outer finish should be removed with soft cheese cloth, rubbing in the direction of the wood grain. Be sure not to rub in a circular motion or across the grain, as this may cause markings to show on the finish.

The complete top of the No. 601-B receiver cabinet is hinged so as to be raised for inserting the tubes, installing the "C" battery and connecting the outside wiring.

If for any reason the chassis must be removed from the No. 601-B receiver cabinet, this can be done by first removing the two large cap screws, shown at "A" in Fig. 12, and then carefully sliding out the complete chassis with front wooden panel attached. **When the chassis is about**

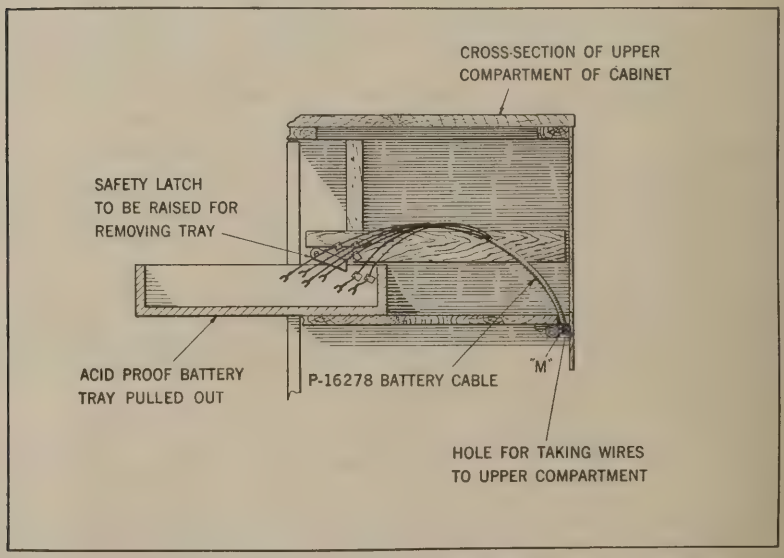


Fig. 14—Cross Section of Tray for Current Supply Units, as provided in the No. 602-B Receiver Cabinet

one-half way out of the cabinet, lift it bodily so as not to allow the lower edges of the metal framework to mar the finish of the woodwork when the rear of the chassis leaves the cabinet opening. The same care should be taken when replacing the chassis in the cabinet.

The rear of the cabinet is provided with two holes as shown in Fig. 12, for bringing-in the outside wires to the chassis binding posts.

§ 6—UNPACKING AND SETTING UP THE NO. 602-B RECEIVER

The No. 602-B Art Console Receiver is packed for shipment in a special wooden case and care should be taken in unpacking to avoid marring the woodwork. To unpack, proceed as follows:

First—Remove the side of the packing case, marked "COVER—OPEN THIS SIDE" by taking out all of the wood screws holding this cover.

Second—Remove two wood screws from each side of the packing case, that are used to hold the side cleats of the cradle upon which the No. 602-B cabinet rides in shipment. These screws will be found about 2 feet from the bottom of the packing case.

Third—Now, slide the No. 602-B cabinet out of the packing case, being sure that no nails, screws or other projecting objects touch the sides or top of the cabinet to mar or scratch the finished surfaces.

Fourth—Remove the upper wooden frame, the one containing the cork cushions, by taking off the front side only.

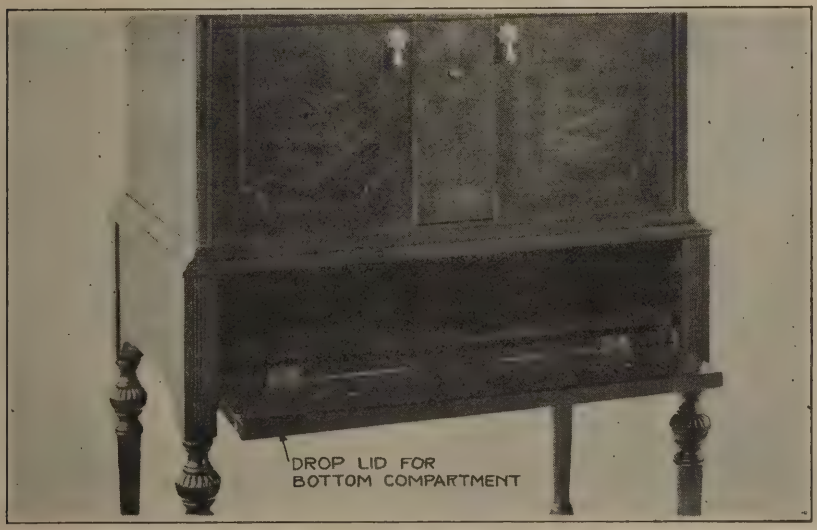


Fig. 15—Lower Compartment of No. 602-B Receiver Cabinet, showing Reserve Storage Space

Fifth—Remove the wooden cradle, upon which the cabinet is suspended in shipment, by taking out the packing screws that can be found on the under side of this framework.

Carefully preserve this packing material for future use, if for any reason, it is desired to re-ship this No. 602-B Receiver.

Dust, finger marks and wax from the packing materials can be removed with soft cheese cloth, rubbing only in the direction of the grain of the wood. Any white accumulations in crevices or corners of the cabinet are rubbing materials that have dried out after the finish has been rubbed and can be removed with a pointed piece of soft wood and a piece of cheese cloth.

The hinged panels on the front of the No. 602-B cabinet are held from opening, during shipment, by metal clips, heavy waxed paper covered. Carefully straighten these clips so that the hinged panels can be opened, after which completely remove the clips. The drop shelf is opened by means of the two pendent pulls "D", shown in Fig. 9. The lower front panel swings down as shown in Fig. 15, the two drawer pulls "H" Fig 9 being provided for this purpose. The two upper panels on the front of the cabinet are hinged at the sides and open from the middle, the finger hold grooves "F" and "F" of Fig. 9 being provided for this purpose.

The chassis, or operating portion of the No. 602-B Receiver, slides into the cabinet like a desk drawer and is held in position during shipment by two heavy cap screws "A" and "A," Fig. 13. These cap screws can be removed by using an automobile type socket wrench, suitable for a ½ inch head hexagonal cap screw or a Stevens "Spintite" No. 8 Socket Wrench.

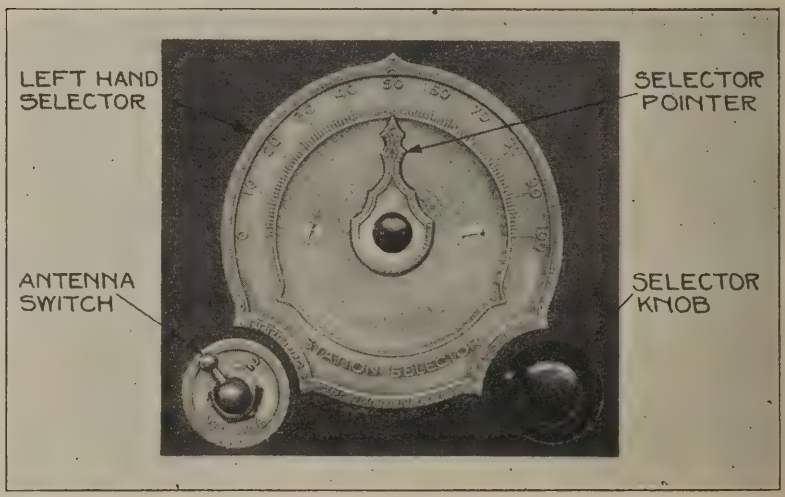


Fig. 16—Left Hand Station Selector with Operating Knob at right and Antenna Coupling Key at the left

It is advisable to preserve these two cap screws and the two washers for future use, in case the radio set is re-shipped. Transporting this No. 602-B Receiver without these cap screws "A" and "A" Fig 13 and washers, to hold the chassis from movement, will result in damage to the cabinet.

The removal of these chassis retaining screws from the No. 602-B cabinet, allows the chassis to be pulled out towards the front by means of the knobs "C" and "C" in Fig 9. Care should be taken when withdrawing this chassis not to mar the finished surface of the drop shelf. A folded newspaper laid across this shelf, so as to overlap the ends and front edge, will provide sufficient protection, when fully withdrawing the chassis, as shown in Fig. 34.

The upper compartment of the No. 602-B cabinet houses an acid-proof battery tray of ample size to hold all "A" and "B" batteries and charger, or "A" and "B" socket power units. Suggested locations for this apparatus in the tray are given under the heading "Installing the Current Supply Apparatus," See Section 22.

This tray slides towards the front, the same as a cabinet drawer and is held from being accidentally pulled completely out by two wood latches "G," Fig. 14, one on each side of the tray. If at any time the battery tray is to be completely removed, these two safety latches can be raised and held out of the notches of the battery tray while withdrawing the latter.

The lower compartment, Fig. 15, provides a storage space that will be found a convenience for holding radio literature, etc.,

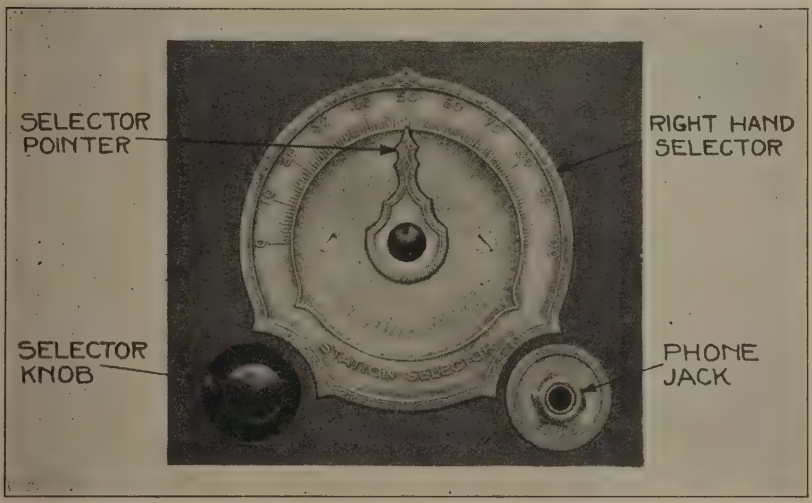


Fig. 17—Right Hand Station Selector with Operating Knob at left and Phone Jack at the right

§ 7—OPERATING CONTROLS

Fig. 1 shows the position of the operating controls of the Nos. 601-B and 602-B Receivers. The STATION SELECTORS (Figs 16 and 17) are the tuning controls, the indicating pointer being operated by the black finished knobs located adjacent to each selector. There is a 10 to 1 reduction gearing between this knob and the station selecting apparatus and pointer, allowing for ease and accuracy in operation.

The VOLTAGE CONTROL knob, located at the right of the voltmeter, Fig. 18, regulates the voltage on the filaments of the vacuum tubes, which is indicated by the voltmeter and should **never be greater than five volts.** To insure correct operation of this control, the voltmeter is provided with a "red" mark at the 5-volt division and the inscription on the face as follows:

"KEEP POINTER TO
LEFT OF RED LINE"

It is not necessary that the full 5 volts be maintained at all times, as any voltage between 4½ and 5 on the scale will allow the receiver to be operated efficiently, especially on loud signals. Turning this VOLTAGE CONTROL knob in the direction of the arrow increases the the voltage.

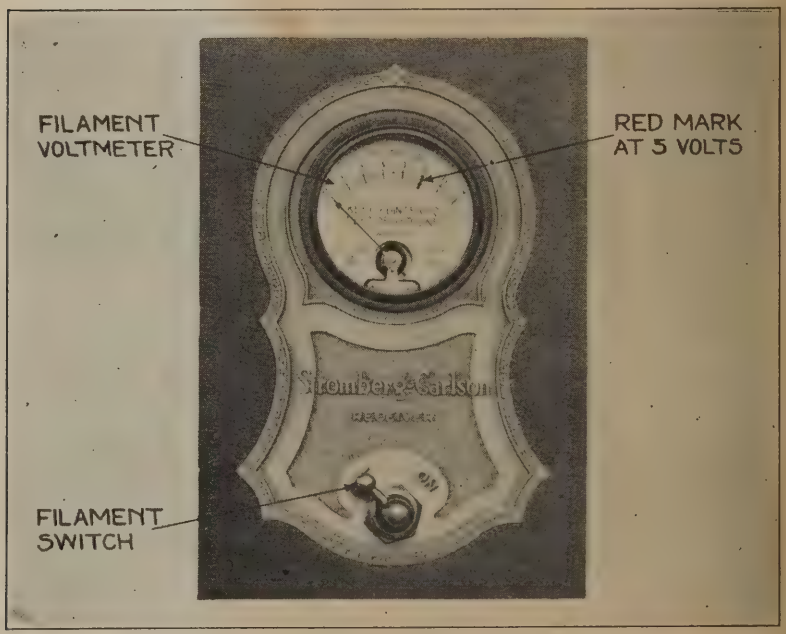


Fig. 18—Filament Voltmeter and Filament Switch

The FILAMENT SWITCH is the two-position key located immediately below the voltmeter in the center of the panel as shown in Fig. 1 and more in detail in Fig. 18. This switch is the only means provided for shutting off the set. Visual indication, as to whether the battery is connected or not, is given by the position of the switch lever and the markings "OFF" and "ON," also by the position of the voltmeter pointer, the latter returning to "O" when the receiver is disconnected.

The ANTENNA key is located at the lower left hand side of the left hand STATION SELECTOR as shown in Fig. 16. This key is to change the degree of the coupling of the antenna to the set, its use being as follows:

If a long aerial (single wire about 60 ft. long) is employed and it is desired to obtain selectivity under these conditions, the ANTENNA key should be thrown to position "1" and if with the same antenna it is desired to dispense with some selectivity and get greater volume or distance, the key should be thrown to position "2."

When a short aerial (about 30 ft. long) is used for obtaining antenna selectivity and it is desired to obtain particularly sharp tuning, the ANTENNA key lever should be placed in position "1." If then it is desired to obtain slightly less selectivity and greater volume or distance, the key lever should be placed in postion "2."

The position of the ANTENNA key should be noted on the station log cards (Fig. 22) in the space provided and marked "ANT. KEY," to insure ease of locating the station from the log.

It is sometimes necessary when receiving the very short waves of the broadcast range, just above 200 meters, to place the ANTENNA key in position "1" in order to get a point of maximum response to the signal.

The PHONE jack provided at the lower right hand side of the right hand STATION SELECTOR and shown in Fig. 17 is provided for plugging-in a loud speaker other than that connected to the terminal board, or it may be used to connect a head set in circuit when desired. Care should be taken to turn the VOLUME CONTROL knob as far as possible in a counter-clockwise direction before putting the head set on, or plugging a head set into this jack. If this VOLUME CONTROL is at maximum, the signal may be so loud as to hurt the listener's ears.

§ 8—DETAILED INSTRUCTION FOR SELECTING STATIONS

The selecting and reproducing of broadcasting programs with the No. 601-B or No. 602-B radio receivers is made simple by the small number of controls employed. The two STATION SELECTOR controls operate independently, yet the fundamental signal from any particular station always comes in at one setting only on each dial as indicated in Fig. 19, thereby preventing confusion and allowing accurate records to be made on the log cards for future reference.

The only other control that requires manipulation when selecting and receiving broadcast programs is the VOLUME CONTROL knob. This allows the volume of signal to be regulated from minimum to maximum as desired. The only precaution is to keep this VOLUME CONTROL down to the point where good clear reproduction is obtained.

Once a station is selected and the volume control is set to give the desired loud speaker reproduction, no further manipulation is required to stop the receiver operating and later to start with the same station, other than the turning of the filament switch Fig. 18, to "OFF" to stop and to "ON" to resume the program. This switch also will connect "A" and "B" socket power units automatically, when the No. 301-A Power Switching Relay is installed as described in Section 21.

The voltage control, which consists of a high-grade voltmeter and an adjusting knob, is located on the front panel of the receiver to be in full view at all times and thereby serve as a safeguard against overworking the vacuum tubes. This voltmeter also insures that the current supply to the tube filament is ample to give efficient operation of the receiver. After once being set for correct voltage, no further manipulation is required, other than an occasional observation to see that the voltmeter pointer is at the left of the red line and not lower than 4½ volts. At any time when the voltmeter pointer fails to indicate 5-volts, with the VOLUME CONTROL knob turned to its maximum position, it is an indication that the storage "A" battery is fully discharged and should be given a prolonged boosting charge to bring it back to normal. Follow the maker's instructions covering the particular battery used.

Before starting to operate the Nos. 601-B and 602-B radio receivers, be sure that the batteries are correctly connected as described in Section 16 on "Current Supply Requirements" and that the vacuum tubes are selected and inserted in the sockets as described in Section 23 on "Vacuum Tube Requirements."

Starting with the battery switch set at the "OFF" position, the operation of the controls should follow the sequence given below:

First—Regulate the voltage on the vacuum tube filaments by first turning the two knobs marked VOLUME CONTROL and VOLTAGE CONTROL, Fig. 1, in a counter-clockwise direction until the stops are reached. Then connect the battery to the tube filaments by moving the switch lever, found directly below the voltmeter, Fig. 18, to the ON position. Finally turn the VOLTAGE CONTROL knob in the direction of the arrow until the voltage pointer is on (or slightly to the left of) the red mark, indicating 5 volts.

Second—Turn the VOLUME CONTROL knob to its maximum position, or in the direction of the arrow on the dial to the full limit of movement.

Third—See that the loud speaker is connected to the binding posts located at the rear of the receiver chassis, Fig. 3, or is plugged into the jack marked "PHONE," Fig. 1. If an external amplifier is used, connect according to the maker's instructions, or as shown in Fig. 8. Also see Section 20.

Fourth—Set the switch lever, marked "ANTENNA," Fig. 1, to position marked "1" if a local or powerful broadcast station is to be selected, or to position "2" if a distant or small powered station is desired. When receiving conditions are good, it is preferable to leave the key lever in position "1" in order to obtain best "selectivity." See Section 13.
When the ANTENNA key lever is moved from one position to the other, be sure to re-tune or set the left hand STATION SELECTOR to the position of maximum response.

Fifth—Turn the two knobs, adjacent to the dials, marked "STATION SELECTORS," to select the desired broadcast station, as explained in detail under the following headings:

(a) "Selecting Stations by the Calibration Curve Method" (Fig. 20).

(b) "Selecting Stations by Hunting or Fishing Method" (Fig. 21).

(c) "Station Selecting by Station Log Method" (Fig. 22).

Sixth—Regulate the volume of the signal in the loud speaker by turning the knob marked "VOLUME" counter-clockwise to decrease the loudness of the signal and in the direction of the arrow to increase the signal volume. This knob can be turned fully to the stops in either direction (minimum and maximum) without danger of injuring the vacuum tube filaments. **It is advisable to keep the volume below the over-loading point of the tubes, otherwise the quality of reproduction will be impaired.** Always keep the VOLUME CONTROL turned down so as to allow for sharpening of the tuning at each STATION SELECTOR, thereby giving maximum selectivity and greater freedom from picking up of foreign noises. (See Section 43.)

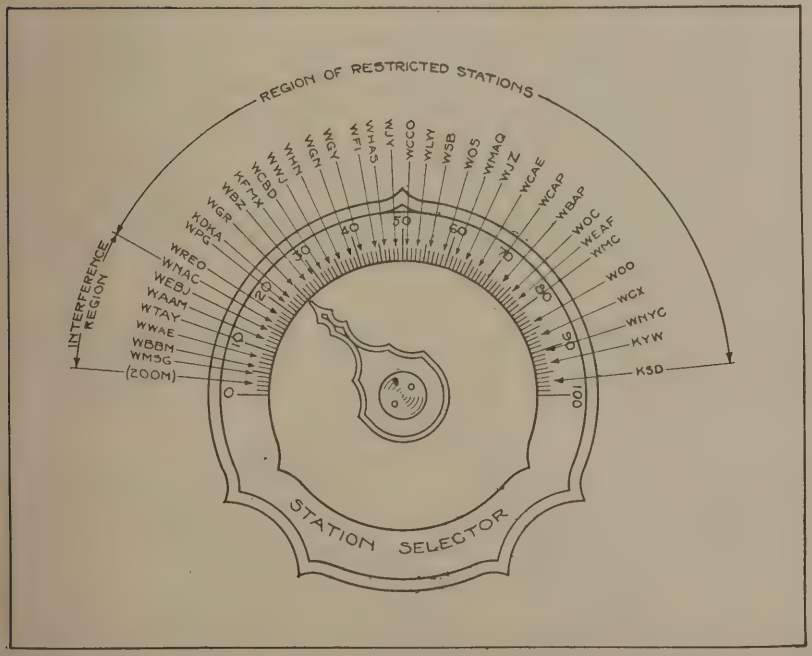


Fig. 19—Typical location of a few Broadcast Stations on a Station Selector

Seventh—When through using the radio receiver, be sure to throw the lever of the switch, located below the voltmeter, Fig. 18, to the "OFF" position. This cuts off all the battery from the tubes and prevents waste of battery current as well as prolongs the life of the vacuum tubes. The voltmeter pointer always returns to "O" when the battery circuit is disconnected by the switch, therefore, the position of this pointer serves as a visual indicator of the connection or disconnection of the battery as well as serving as a measuring instrument.

Eighth—After about a week's experience with this receiver and after logging a number of stations, the simplicity and reliability of operation will be appreciated. Also, during this time you will have had experience with both good and bad "radio weather," and know what to expect on distant stations under the varying conditions which are not controlable by the manufacturer of this equipment.

§ 9—SELECTING STATIONS BY THE CALIBRATION CURVE METHOD

This is a rapid and positive method of selecting a broadcasting station for the first time, when the wave-length in meters is known, the latter information usually being published in all printed radio programs. See Section 49 for wave-lengths of Broadcasting Stations.

An accurate calibration curve, Fig. 20, is furnished with each of the Nos. 601-B and 602-B radio receivers for this method of station selecting. Referring to this calibration chart, follow the particular horizontal line that corresponds to the published (or known) wave length (in meters) of the desired station, to the point of intersection with the red diagonal line.

At this point follow down on the vertical line to the numbering on the bottom of the chart, which gives the correct setting for the pointer of the right hand STATION SELECTOR. This is illustrated in Fig. 20, which shows how to select station WHAS (Louisville, Ky.) which has a wave length of 400 meters, the setting of the right hand STATION SELECTOR in this case being found to be 47.

After setting the pointer on the right hand STATION SELECTOR dial as just described, then the pointer of the left hand STATION SELECTOR should be rotated through a range of about ten divisions above and below the setting for the pointer on the right hand STATION SELECTOR, or until the signal comes in at maximum response.

Now, move the pointer of the right hand STATION SELECTOR through a range of about three divisions above and below the initial (calibration curve) setting to find the exact point where the signal comes in at maximum response on this selector. See Section 37 for special instructions covering the operation, when a loop is used.

Keeping the VOLUME CONTROL knob turned down (counter-clockwise direction) to the point where the signal is just heard in the speaker, will facilitate the setting of the STATION SELECTORS for maximum response. As soon as the STATION SELECTORS are both tuned sharply on the desired signal, the volume can be changed at will by turning the VOLUME CONTROL knob, without interfering with the tuning. Always avoid

overloading the detector or the second audio tubes, which may result from turning-up the VOLUME CONTROL too high, resulting in a "rattling" sound in the speaker.

After the station call letters are heard, you can record the two corrected STATION SELECTOR settings and the setting of the ANTENNA key on the station log card, as shown in Fig. 22, or in the spaces provided in the table of Broadcasting Stations of Section 49 of this book.

Instead of listing the broadcast station wave lengths in "meters" as at present, it has been suggested by the U. S. Department of Commerce that these listings be made in "Frequency" and expressed in "Kilocycles" per second. The calibration curves furnished with these Nos. 601-B and 602-B radio receivers give "Kilocycles" on the right hand side of the chart, thus allowing station selecting to be made by this method, when desired.

§ 10—SELECTING STATIONS BY HUNTING OR FISHING METHOD

When it is desired to determine quickly what stations are coming-in satisfactorily or to locate stations without a radio program, the two STATION SELECTOR pointers can be rotated together for selecting stations as follows:

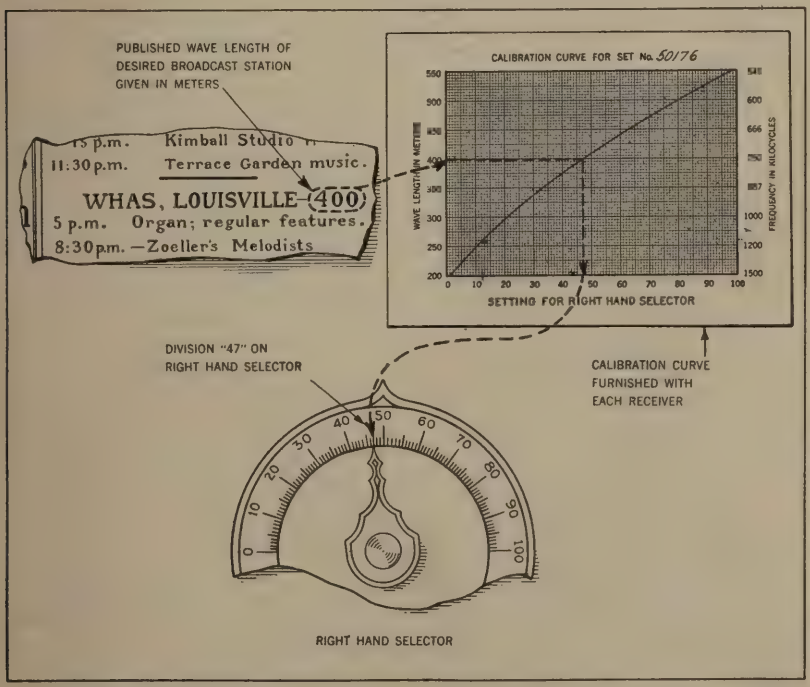


Fig. 20—Selecting Stations by the Calibration Curve Method

Starting with the pointers of the two STATION SELECTORS at "O" setting, rotate the right hand pointer slowly about two divisions at a time and follow with the left hand STATION SELECTOR pointer, oscillating the latter pointer a few divisions above and below each setting of the right hand pointer. When a station is heard, re-set each pointer to the position giving the loudest volume of signal, recording the settings of the two STATION SELECTORS on the log card, Fig. 22, or in the spaces provided in Section 49, when the call letters are heard.

It will be found that the two pointers of the STATION SELECTOR dials will keep practically together or with a fixed difference in setting for the

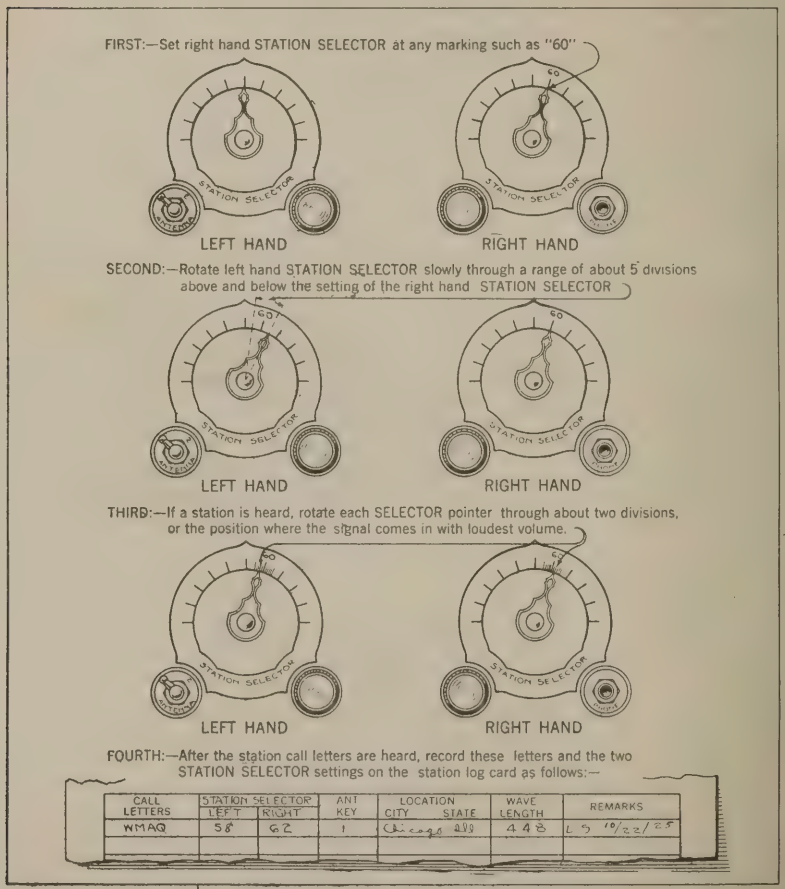


Fig. 21—Selecting Stations when the Wave Lengths are not known

whole length of the scales, providing the antenna is not changed and the ANTENNA key is kept in one of its two positions throughout the time of selecting. See Section 37 covering special instructions for selecting stations, when a loop is used.

Fig. 21 shows how this hunting method of station selecting can be done, without requiring that the start be made at the "0" end of the scales.

After becoming familiar with the operation of these two STATION SELECTOR controls, it will be possible to select stations without noticing the positions of the selector pointers, in fact, the receiver can be operated in the dark, especially on local or powerful broadcast signals.

§ 11—SELECTING STATIONS BY STATION LOG METHOD

Once you have recorded dial settings for a number of broadcast stations on the station log cards, or in the spaces provided in Section 49, you can obtain broadcast reception from these stations at any future time if the stations are broadcasting and conditions are favorable, by merely setting the pointers of the two STATION SELECTOR dials to correspond to the recorded numbers as shown in Fig. 22.

The ANTENNA key should be set at the position indicated on the station log card and it is advisable to "sharpen the tuning" of the STATION SELECTORS by first turning down the VOLUME CONTROL and then to slightly move the pointers of each of these selectors above and below the recorded markings, until the signals come in with maximum response, to insure best reproduction.

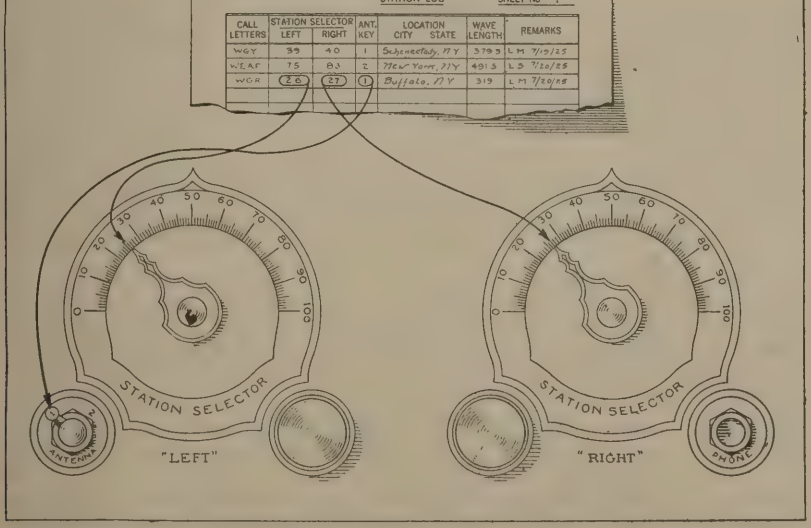


Fig. 22—Selecting Stations by Station Log Card Records

§ 12—ACCURACY OF STATION LOG RECORDS

The Nos. 601-B and 602-B Stromberg-Carlson radio receivers have specially designed variable condensers and all of the apparatus rigidly mounted, so as to maintain the accuracy of the dial settings and insure the picking up of a station on the exact markings recorded on the station log card.

After setting the station selectors in accordance with the record on the station log card, it is always advisable to turn down the VOLUME CONTROL to give a weak signal in the speaker, and then to accurately sharpen the tuning of each station selector (set each selector to give maximum response of signal) to be sure that the station comes in with full volume and free from other station interference. The reason for this precaution is that some of the broadcast stations fail to keep accurately on their wave lengths at all times and this deviation may be the equivalent of several divisions on the station selector away from the settings recorded on the station log card. If the antenna or ground connections are changed in any way, the records of the setting of the left hand STATION SELECTOR on the station log card must be changed to correspond to the new conditions.

The setting of this left hand STATION SELECTOR also is dependent on the position of the ANTENNA key lever, when an antenna is used, therefore, it is advisable to record the position of the antenna key on the station log card in the column marked "ANT. KEY" as indicated in Fig. 22. See special instructions covering operation with a loop, in Section 37.

However, the log card records of the **right hand STATION SELECTOR settings** are not affected by changes in the antenna and ground, the setting of the ANTENNA key, or the use of a loop, and will always hold good regardless of where the particular Nos. 601-B or 602-B radio receiver is located.

Thus, if the receiving set is moved to a new location or the antenna or ground is changed or a loop connected instead of an antenna, recorded stations can be quickly selected as follows:

> First, adjust the right hand STATION SELECTOR to correspond with the settings listed on the station log card. Then, with a low volume of signal in the loud speaker, rotate the left hand STATION SELECTOR slowly above and below the setting originally recorded on the station log card for that selector, until the station is heard with maximum response. It is advisable to start a new station log card for these new conditions and then maintain a new and accurate record of both selector settings.

When it is desired to **maintain extreme accuracy** of the station log recordings, the radio amplifier tubes should always be used in the same tube sockets. Numbering these tubes as suggested in Section 26 on "Selection of the Radio Amplifier Tubes" will insure getting the tubes back in the same sockets, if removed for any reason.

When replacing worn out tubes, it is advisable to check the station log records for some of the important stations, such as KDKA, WGY, WJZ, WEAF, KYW, KSD, KHJ, etc., and see if these stations come in on the same selector settings for the new tubes as recorded for the old tubes. If not, and the variations are more than one division, it may be desired to start a new set of station log cards.

The column under "REMARKS" on the station log card is provided for records regarding strength of signal received, date and time when signal was first tuned-in, etc, This information can be recorded in concentrated form by using the following abbreviations:

Name	Abbreviations
Head Set	H
Loud Speaker	L
Weak Signal Strength	W
Medium Signal Strength	M
Strong Signal Strength	S

For example, if the signal is received on a loud speaker and came in with medium volume, this information can be expressed by the two letters "LM" on the log card under "REMARKS." This will leave space in the same column for the date when the station was first tuned-in, by using figure abbreviations, say 10-28-25 for Oct. 28, 1925.

§ 13—TO OBTAIN FULL SELECTIVITY

The Stromberg-Carlson No. 601-B and No. 602-B radio receivers are designed to be as selective as it is possible to make a receiver and still maintain the presence of the "side band" frequencies of the transmission that give to the speech and music its full quality and richness. No operating skill is required to obtain this selectivity when the receiver is correctly installed, as the mere setting of the station selectors to a maximum response, (loudest signal), is the only requirement. Always sharpen the tuning with a low volume of signal in the speaker, after which the volume can be increased as desired.

If the station selectors are not tuned for maximum response, maximum selectivity and best quality of reproduction is not obtained.

The separation of two distant broadcast stations, working on wave lengths of only a few meters apart is a simple matter. The only precaution is to move both selectors the same number of divisions (or a fraction of one division) to cut out the one station and bring in the other station.

When there is likely to be interference between powerful local stations it is advisable to first select these stations, when only one is working at a time, and record on the station log cards. These records simplify the subsequent station selecting operations and allow any one of the powerful local stations to be tuned-in without noticeable interference from the other stations.

Full selectivity cannot be obtained when an extremely long antenna (over 80 feet, including the lead-in wire) is used. For best selectivity, an antenna of short length, not over 20 feet to 30 feet including the lead-in wire, should be employed and the ANTENNA key lever set in position marked "1." If it is impossible to tune the left hand STATION SELECTOR within a space of 10 divisions on the dial, when the ANTENNA key is set at position "1," **then the antenna wire is too long.** See Fig. 41 and description for suggestions regarding the installation of two antennas, a short and a long length, with a switch for using either one, as desired.

When a Stromberg-Carlson No. 101-A Loop is used with the No. 601-B or the No. 602-B receiver, it is possible to position the loop to obtain increased selectivity as described in Section 37.

§ 14—DETERMINING THE WAVE LENGTH OF A STATION

The "Calibration Curve" together with the reading of the calibrated or right hand STATION SELECTOR allows the wave length and meters of any station tuned-in, to be closely determined.

First—Be sure that the right hand STATION SELECTOR is tuned to the maximum response (loudest signal) for the station in question. Have the VOLUME CONTROL turned down for a weak loud speaker signal, when setting this STATION SELECTOR.

Second—Select the vertical line on the "Calibration Curve" corresponding to a reading of the right hand "STATION SELECTOR," say "80," and follow this line to the point where it intersects or meets the diagonal "red" line.

Third—From this intersection point follow a horizontal line until the marking at the left hand side of the diagram is reached, say "500." This is the wave length in meters of the station tuned-in.

This information will serve as a check and identification of a station when the announcer's voice comes through indistinct. For example, the program received at the setting of "80" on the right hand STATION SELECTOR and found by the above method to be "500 meters" can be identified as station "WMC," Memphis, Tennessee, by referring to a printed list of broadcasting stations in Section 49 of this book.

It will be noticed that the right hand side of the "Calibration Curve" diagram is marked "Frequency in Kilocycles," this being another and more scientific way of designating the radio frequency of a broadcast station. The frequency of a station tuned-in, can be found by using the above method, but instead of following the horizontal line to the left as given in the "third" paragraph, follow this horizontal line to the right and read the "Kilocycles." In the case cited above, a right hand STATION SELECTOR reading of "80" would give a frequency of 600 kilocycles for the calibration curve shown in Fig. 20. Thus, a Stromberg-Carlson No. 601-B or No. 602-B Radio Receiver is a fairly accurate "wave meter" when used as above described.

§ 15—CONNECTING CABLE FOR EXTERNAL APPARATUS

Each No. 601-B and 602-B radio receiver is provided with a special cable for connecting the current supply to the receiver, also the necessary jumper wire cords for connecting the several blocks of "B" and "C" batteries together or to the receiver.

The current supply cable (P-16278) contains the six conductors, one end of the cable being attached to the terminal board of the receiver at the factory. For convenience in packing and shipping the No. 601-B receiver, this cable is coiled up inside the cabinet. When the No. 601-B receiver is installed, the free end of the cable is taken out through the hole "N" Fig. 12, provided in the back of the cabinet, and the terminals on the individual conductors attached to the batteries or other current supply apparatus as subsequently described.

When a No. 61 Radio Cabinet Table is used this battery cable is carried into the battery compartment through one of the upper ventilating holes, found in the back of this table.

In the No. 602-B receiver, the free end of this battery supply cable is carried to the battery tray in the upper part of the cabinet as shown in Fig. 14, and is in position for connecting the power supply units.

The three conductors provided for connecting the "C" battery to the receiver come already attached to the terminal board as shown in Fig. 31 and together with one or more of the P-16026 black jumper wires, allow any of the several combinations of dry cell "C" batteries to be installed as subsequently described.

Three of the P-16026 black jumper wires are provided for connecting together three or four blocks of dry cell "B" batteries, when used. See Figs. 3 to 8 inclusive.

The conductors furnished for connecting the receiver chassis to the various outside apparatus are provided with designating colors in the braided coverings, these colors conforming to the A. M. E. S. Standard Color Code, as follows:

Color of Wire	To External Apparatus	Polarity	Voltage
Solid Yellow	"A" Battery	+	6
Black, Yellow Tracer	"A" Battery	—	0
Solid Red	"B" Current Supply	+	135 or 180
Maroon and Red	"B" Current Supply	+	90
Solid Maroon	"B" Current Supply	+	45
Black, Red Tracer	"B" Current Supply	—	0
Solid Green	"C" Battery	+	0
Green and Black	"C" Battery	—	4½
Black, Green Tracer	"C" Battery	—	9, 13½ or 27 (*)
Solid Blue	Loop	High Side	
Blue and Black	Loop	Mid Tap	
Black	Loop	Low Side	
Solid Brown	Loud Speaker	+	
Black, Brown Tracer	Loud Speaker	—	

(*) This voltage should be selected to fit the type of tube and voltage of "B" battery used in the 2nd audio amplifier, as subsequently described. In addition to the use of standard A. M. E. S. designation colors, for aid in selecting the conductors for connecting the external apparatus to these receivers, the free end of each conductor is provided with a substantial designation tag plainly marked to show where the particular conductor is to go.

The free ends of the battery connecting conductors are provided with A. M. E. S. standard type of spade cord tips and will fit all binding posts and spring terminal clips on standard "A," "B" or "C" batteries or socket power units.

The binding post nuts on the terminal board of these receivers are provided with wide deep slots, so as to be securely tightened or easily loosened by using a penny or a 25 cent coin as a wrench.
The loop conductors come attached to the loop, and being special equipment, is furnished only on separate order.

§ 14—DETERMINING THE WAVE LENGTH OF A STATION

The "Calibration Curve" together with the reading of the calibrated or right hand STATION SELECTOR allows the wave length and meters of any station tuned-in, to be closely determined.

First—Be sure that the right hand STATION SELECTOR is tuned to the maximum response (loudest signal) for the station in question. Have the VOLUME CONTROL turned down for a weak loud speaker signal, when setting this STATION SELECTOR.

Second—Select the vertical line on the "Calibration Curve" corresponding to a reading of the right hand "STATION SELECTOR," say "80," and follow this line to the point where it intersects or meets the diagonal "red" line.

Third—From this intersection point follow a horizontal line until the marking at the left hand side of the diagram is reached, say "500." This is the wave length in meters of the station tuned-in.

This information will serve as a check and identification of a station when the announcer's voice comes through indistinct. For example, the program received at the setting of "80" on the right hand STATION SELECTOR and found by the above method to be "500 meters" can be identified as station "WMC," Memphis, Tennessee, by referring to a printed list of broadcasting stations in Section 49 of this book.

It will be noticed that the right hand side of the "Calibration Curve" diagram is marked "Frequency in Kilocycles," this being another and more scientific way of designating the radio frequency of a broadcast station. The frequency of a station tuned-in, can be found by using the above method, but instead of following the horizontal line to the left as given in the "third" paragraph, follow this horizontal line to the right and read the "Kilocycles." In the case cited above, a right hand STATION SELECTOR reading of "80" would give a frequency of 600 kilocycles for the calibration curve shown in Fig. 20. Thus, a Stromberg-Carlson No. 601-B or No. 602-B Radio Receiver is a fairly accurate "wave meter" when used as above described.

§ 15—CONNECTING CABLE FOR EXTERNAL APPARATUS

Each No. 601-B and 602-B radio receiver is provided with a special cable for connecting the current supply to the receiver, also the necessary jumper wire cords for connecting the several blocks of "B" and "C" batteries together or to the receiver.

The current supply cable (P-16278) contains the six conductors, one end of the cable being attached to the terminal board of the receiver at the factory. For convenience in packing and shipping the No. 601-B receiver, this cable is coiled up inside the cabinet. When the No. 601-B receiver is installed, the free end of the cable is taken out through the hole "N" Fig. 12, provided in the back of the cabinet, and the terminals on the individual conductors attached to the batteries or other current supply apparatus as subsequently described.

When a No. 61 Radio Cabinet Table is used this battery cable is carried into the battery compartment through one of the upper ventilating holes, found in the back of this table.

In the No. 602-B receiver, the free end of this battery supply cable is carried to the battery tray in the upper part of the cabinet as shown in Fig. 14, and is in position for connecting the power supply units.

The three conductors provided for connecting the "C" battery to the receiver come already attached to the terminal board as shown in Fig. 31 and together with one or more of the P-16026 black jumper wires, allow any of the several combinations of dry cell "C" batteries to be installed as subsequently described.

Three of the P-16026 black jumper wires are provided for connecting together three or four blocks of dry cell "B" batteries, when used. See Figs. 3 to 8 inclusive.

The conductors furnished for connecting the receiver chassis to the various outside apparatus are provided with designating colors in the braided coverings, these colors conforming to the A. M. E. S. Standard Color Code, as follows:

Color of Wire	To External Apparatus	Polarity	Voltage
Solid Yellow	"A" Battery	+	6
Black, Yellow Tracer	"A" Battery	—	0
Solid Red	"B" Current Supply	+	135 or 180
Maroon and Red	"B" Current Supply	+	90
Solid Maroon	"B" Current Supply	+	45
Black, Red Tracer	"B" Current Supply	—	0
Solid Green	"C" Battery	+	0
Green and Black	"C" Battery	—	4½
Black, Green Tracer	"C" Battery	—	9, 13½ or 27 (*)
Solid Blue	Loop	High Side	
Blue and Black	Loop	Mid Tap	
Black	Loop	Low Side	
Solid Brown	Loud Speaker	+	
Black, Brown Tracer	Loud Speaker	—	

(*) This voltage should be selected to fit the type of tube and voltage of "B" battery used in the 2nd audio amplifier, as subsequently described. In addition to the use of standard A. M. E. S. designation colors, for aid in selecting the conductors for connecting the external apparatus to these receivers, the free end of each conductor is provided with a substantial designation tag plainly marked to show where the particular conductor is to go.

The free ends of the battery connecting conductors are provided with A. M. E. S. standard type of spade cord tips and will fit all binding posts and spring terminal clips on standard "A," "B" or "C" batteries or socket power units.

The binding post nuts on the terminal board of these receivers are provided with wide deep slots, so as to be securely tightened or easily loosened by using a penny or a 25 cent coin as a wrench.
The loop conductors come attached to the loop, and being special equipment, is furnished only on separate order.

§ 16—CURRENT SUPPLY REQUIREMENTS

The Nos. 601-B and 602-B radio receivers are designed to accomodate several arrangements of Radiotron tubes as described in Section 23, also several arrangements of current supply units to operate these tubes, as follows:

(a) **For 5 UX-201-A Tubes, 1 UX-112 Tube and Battery Current Supply:** 6-volt Storage "A" Battery with Tungar Charger, 135 volts of dry cell "B" battery, and 9 volts of "C" battery. (Figs. 3 and 25)

(b) **For 5 UX-201-A Tubes, 1 UX-112 Tube, Socket-Power "A" and 135 volts of "B" Battery:** 6-volt trickle charge Storage "A" Battery, 135 volts of dry cell "B" battery, 9 volts of "C" battery and 1 socket power switching relay (Figs. 4 and 26).

(c) **For 5 UX-201-A Tubes, 1 UX-112 Tube, Socket-Power "A" and 180 volts of "B" Battery:** 6-volt trickle charge Storage "A" Battery, 180 volts of dry cell "B" battery, 13½ volts of dry cell "C" battery and 1 socket-power switching relay (Figs. 5 and 27).

(d) **For 5 UX-201-A Tubes, 1 UX-112 Tube and Socket-Power "A" and "B" Units:** 6-volt trickle charge Storage "A" Battery, "B" Socket Power with 135-volt tap, 9 volts of "C" battery and 1 socket power switching relay (Figs. 6 and 28).

(e) **For 5 UX-201-A Tubes, 1 UX-171 Tube and Socket-Power "A" and "B" Units:** 6-volt trickle charge Storage "A" Battery, "B" Socket Power with 135-volt tap (or 135-volt dry cell "B" battery) 27 volts and "C" battery and 1 socket-power switching relay (Figs. 7 and 29).

(f) **For 5 UX-201-A Tubes and External Power Amplifier:** 6-volt trickle charge Storage "A" Battery, "B" Socket Power with 90-volt tap (or 90-volt dry cell "B" battery), 4½ volts of "C" battery and 1 socket power switching relay. (Figs. 8 and 30).

The description of the various current supply units recommended for use with these receivers is given in detail under the following headings:

(a) Filament or "A" Current Supply, see Section 17.
(b) Plate or "B" Current Supply, see Section 18.
(c) Grid or "C" Battery Supply, see Section 19.
(d) External Power Amplifier, see Section 20.
(e) No. 301-A Power Switching Relay, see Section 21.

Instructions covering the installation of this Current Supply Apparatus are given under the heading "Installing the Current Supply Apparatus," see Section 22.

§ 17—FILAMENT OR "A" CURRENT SUPPLY

The current for heating the filaments of the vacuum tubes in the Nos. 601-B and 602-B radio receivers is best supplied from the so-called Storage "A" Battery. This battery, however, can be arranged in several ways:

First—For Intermittent Charging at Home, when a 60 cycle, 110-volt alternating current house lighting circuit is available to operate a battery charger. From the standpoint of economy of operation and freedom from heat and fumes that might otherwise be gen-

erated when charging, the battery in this case preferably should be of small capacity, say a 6-volt 50 ampere-hour size and the battery charger of **not over a 2-ampere charging rate.**

This charger **should be of the insulated type,** such as the No. 2857 Tungar Rectifier, so that the lighting circuit will not have a metallic connection to the receiving set, with the danger of burning out the vacuum tubes, if the receiver is turned on while the battery is being charged. Figs. 3 and 25 show the wiring and location of a Storage "A" Battery and Battery Charger for he Nos. 601-B (No. 61 Radio Cabinet Table) and 602-B Receivers.

Second—For Automatically Charging by the Trickle Method, when a 60 cycle, 110-volt alternating current house lighting circuit is available to operate the trickle charger, that usually is supplied as a unit with a 6-volt Storage "A" Battery and known as an "A" Socket Power Unit. With this arrangement, the Storage "A" Battery is automatically kept in condition by a continuous charge at a very low rate, this charge taking place at all times when the receiver is not in operation.

It is essential that the reserve battery capacity and the trickle charge rate be ample to handle the No. 601-B or No. 602-B receivers when operated up to 6 or 7 hours per day, average. This requires a battery of 6-volts and approximately 40 ampere hours capacity, with a trickle charge rate of .4 to .8 amperes. For example, the Gould AC-6 Unipower or equivalent. In all cases, it is important that the purchaser follow the detailed instructions, covering the particular battery selected or furnished.

If this "A" Socket-Power Unit is to be switched on and off by the Stromberg-Carlson No. 301-A Power Switching Relay, there should be no self-contained switch built into the unit, as described under the heading "No. 301-A Power Switching Relay" Section 21. Figs 4 to 8, inclusive, show the wiring of this type of "A" Socket-Power Unit, while Figs. 26 to 30, inclusive show the arrangement in the receiver cabinets.

Third—For Charging at a Service Station, when no charging current or charging apparatus is available in the building where the radio receiver is installed. In this case, the battery should be preferably of large capacity to provide for several weeks service on each charge, say a 6-volt, 150 ampere-hour size. Figs 3 and 25 illustrate how this type of "A" battery is connected to the receiver, the charging rectifier shown, being omitted.

The location of the Storage "A" Battery, charging rectifier, or other "A" current supply units in the battery tray (Fig. 14) of the No. 602-B receiver cabinet, or in the battery compartment (Fig. 10) of the No. 61 Radio Cabinet Table, when used with the No. 601-B Receiver, should follow the instructions given in Section 22.

The total current drain, from the "A" current supply, required to heat the filament of the vacuum tubes used in the Nos. 601-B and 602-B receivers, is as follows:

The total current drain (approximate) from the "B" current supply units, for the various combination of tubes specified for the No. 601-B and 602-B radio receivers, when operated with "B" battery voltages of; 45 volts for the detector tube, 90 volts for the three radio and 1st audio tubes, and 135 volts for the 2nd audio tube, is as follows:

Number of Tubes	Kind of Tubes	Total "B" Current	Circuit
5	UX-201-A	22 Milli-Amps.	Fig. 8
5 1	UX-201-A UX-112	28 Milli-Amps.	Figs. 3, 4, 5 and 6
5 1	UX-201-A UX-171	38 Milli-Amps.	Fig. 7

This table indicates the "B" battery current required when the UX-112 and UX-171 power output tubes are employed and 135 volts of "B" battery is used. This current drain must be taken into consideration when selecting dry cell "B" batteries or "B" socket-power units, other than those recommended in this book.

§ 19—GRID OR "C" BATTERY SUPPLY

The No. 601-B and 602-B radio receivers are designed for a negative bias on the 1st and 2nd audio amplifier tubes as described under the heading "Vacuum Tube Requirements," see Section 23. Dry cell type of "C" batteries sould be used to obtain this negative bias, regardless of the type of "B" battery current supply employed.

For 4½ volt bias one "Eveready" No. 771, or equivalent size of other reliable make, should be employed, wired as shown in Fig. 8.

For 9-volt bias, two "Eveready No. 771, or equivalent size of some other reliable make, wired as shown in Figs. 3, 4 and 6.

For 13½ volt bias, three "Eveready" No. 771, or equivalent size of other reliable make, wired as shown in Fig. 5.

For 27 volt bias, one "Eveready" No. 771 and and one "Eveready" No. 768 batteries or equivalent sizes of other reliable make, wired as shown in Fig. 7.

These "C" batteries should be placed in the radio receiver as shown in Figs. 31 and 32. When connecting to the receiver, the solid green cord should go to the "C" battery terminal marked "+" and the cord with half green and half black covering to the "—4½" volt terminal of the same battery. The cord with black and a green thread tracer should go to the "—" terminal of the second or third "C" battery as shown in Figs. 3, 4, 5, 6, and 7. When two "C" batteries are used, the "—" terminal of the first "C" battery must be connected to the "+" terminal of the second "C" battery with one of the P-16026 jumper wires or by the jumper wire provided on the No. 768 battery, if the latter is used. Fig. 5 shows the wiring when three blocks of "C" batteries are used, requiring 2 P-16026 wires.

These dry cell "C" batteries should be replaced every six months, regardless of the amount of use, and at an earlier time, if exhausted by excessive use of the receiver. It is a safe rule to replace the "C" battery at the same time the dry cell "B" batteries (if used) are replaced.

§ 20—EXTERNAL POWER AMPLIFIER

The audio amplifying system provided in the Nos. 601-B and 602-B radio receivers is designed to give a new high quality of tonal reproduction at a volume that is ample for the largest home living room without overloading the Radiotron tubes recommended in this instruction book. Any greater volume requires tubes of greater power output and "B" battery voltages that are so high as to be impracticable to incorporate in a home type of radio receiver.

However, these Nos. 601-B and 602-B receivers are so designed as to accommodate the super-power type high voltage amplifiers, such as the Western Electric No. 6025-B and the R. C. A. Uni-Rectron model AP-935. The amplifying tube used in these super-power amplifiers is capable of giving over twelve times the undistorted output that is possible with the UX-112 tube, when the latter is operated with a 135 volt "B" current supply. Thus, when these external amplifiers are used with suitable high quality Cone type speakers, such as the Stromberg-Carlson No. 5-A Cone Speaker, a fullness and richness of volume can be obtained that will accommodate a large size hall. The only operating precaution is to avoid turning-up the VOLUME CONTROL on the receiver to the point of overload of the detector tube, indicated by predominance of "hissing" or "s" sounds in the loud speaker.

These external amplifying systems require one stage of high quality audio frequency amplification in the radio receiver, such as is provided when a radio plug is inserted into the jack located on the audio panel of the No. 601-B or No. 602-B radio receiver, between the 1st and 2nd audio tube sockets and marked "EXTERNAL AMPLIFIER" as shown in Figs. 8 and at "A" in Fig. 31.

The act of inserting this plug, cuts-off the last (2nd) audio amplifier tube, requiring that the VOLTAGE CONTROL knob be turned counter-clockwise to reduce the voltage on the remaining five tubes to the safe limit as indicated on the voltmeter.

When the plug is inserted to connect this external power amplifier, the PHONE jack on the front panel of the receiver, as well as the loud speaker permanently connected to the SPEAKER binding posts at the receiver terminal board are automatically disconnected from service.

All necessary changes in volume of the loud speaker reproduction, when using the external power amplifier system, are made with the VOLUME CONTROL knob on the No. 601-B or No. 602-B receiver panel as previously described in this book.

Due to the extraordinary volume obtainable with these high power external amplifying systems, it may be necessary to locate the loud speaker about 10 to 20 feet away from the radio receiver, so that the person tuning the receiver will be able to better judge the quality of the reproduction. Also, it may be found that the air vibrations from the loud speaker will be of such power as to cause acoustic coupling with the receiver detector tube, unless the loud speaker is positioned so as to be out of the critical coupling distance from the receiving set. See Section 25 for instructions covering the selection of a non-microphonic detector tube as a means of avoiding acoustic coupling, and Section 47 for instructions covering the No. 5-A Cone Speaker.

When connecting one of the external super-power amplifiers to the Nos. 601-B and 602-B radio receivers, be sure to run a wire from the binding post on the amplifier, marked "G" or "GROUND," to the same ground used for the radio receiver as shown in Fig. 8. This will overcome any noticeable 60 cycle hum, when the loud speaker is reproducing broadcasting station programs.

§ 21—NO. 301-A POWER SWITCHING RELAY

Heretofore, the connecting and disconnecting of the "A" and "B" socket power units, to and from a radio receiver, has been accomplished by means of a special switch, built-into one or both of these units.

If an external super-power amplifier unit, such as the Western Electric No. 6025-B or the R. C. A. Model AP-935, is used, there is still another switch to be operated, when turning on or off the receiver. It is obvious that the operator of a radio receiver installation, in which these several units are used, must have complete knowledge of the location and use of the various switches, greatly complicating the handling of the receiver.

This complication is entirely overcome by installing a Stromberg-Carlson No. 301-A Power Switching Relay as shown in the wiring diagrams Figs. 4 to 8, inclusive. All of the switching of the house lighting circuit connections for the "A" and "B" Socket-Power Units and for the External

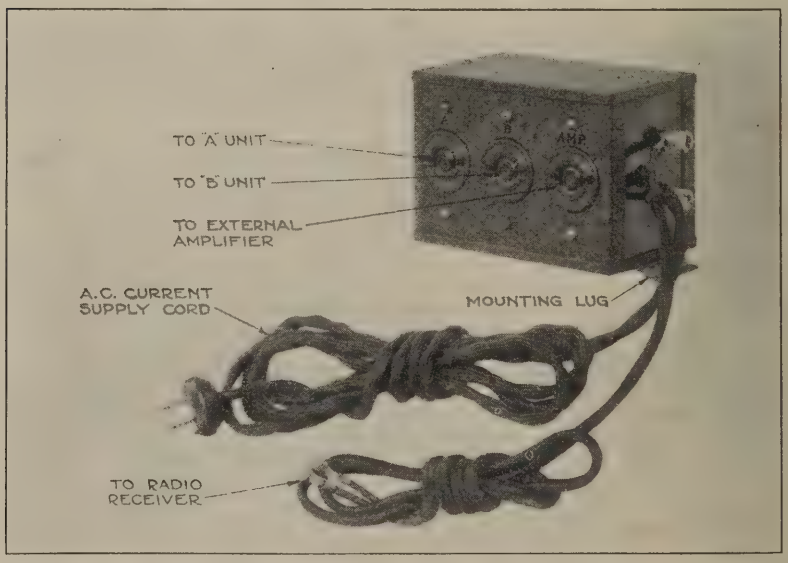


Fig. 23—No. 301-A Power Switching Relay for automatically controlling Socket-Power Units from the Receiver Filament Switch

Super-Power Amplifier Unit are made automatic, the act of turning the lever at the filament switch, Fig. 18, being the only "ON" or "OFF" operation required.

The No. 301-A Power Switching Relay is shown in Figs. 23 and 24, the house lighting circuit being connected through the 6 foot cord and attachment plug. One side of the casing of this No. 301-A Power Switching Relay has three standard size "convenience" outlets, marked as follows:

"A" For connecting the "A" Socket-Power Unit.

"B" For connecting the "B" Socket-Power Unit (when used).

"AMP" For connecting an External Super-Power Amplifier (when used).

A 4-foot, two-conductor cord, terminating in standard A. M. E. S. spade type cord tips, comes attached to one end of the No. 301-A Power Switching Relay Casing, for furnishing the operating connection to the No. 601-B or No. 602-B radio receiver. Terminals, marked "R-1" and "R-2" are provided on the terminal board of the No. 601-B and 602-B radio receivers for these relay operating conductors, connections being made as shown in Figs. 4 to 8, inclusive, and in Fig. 31.

The current required for operating the No. 301-A Power Switching Relay is almost negligible and is taken from the storage "A" battery, being controlled by the operation of the filament switch, Fig. 18.

When this relay is in its normal un-operated position, the house lighting circuit is connected through the relay contacts to the convenience outlet marked "A" and hence to the trickle charger of the "A" Socket-Power (if the latter is plugged-into this outlet) as shown in Fig. 24.

When this relay is in its operated position (caused by turning the filament switch Fig 18 to "ON") the house lighting circuit is completely disconnected from the trickle charger of the "A" Socket-Power and automatically connected to the "convenience outlets" marked "B" and "AMP." Thus,

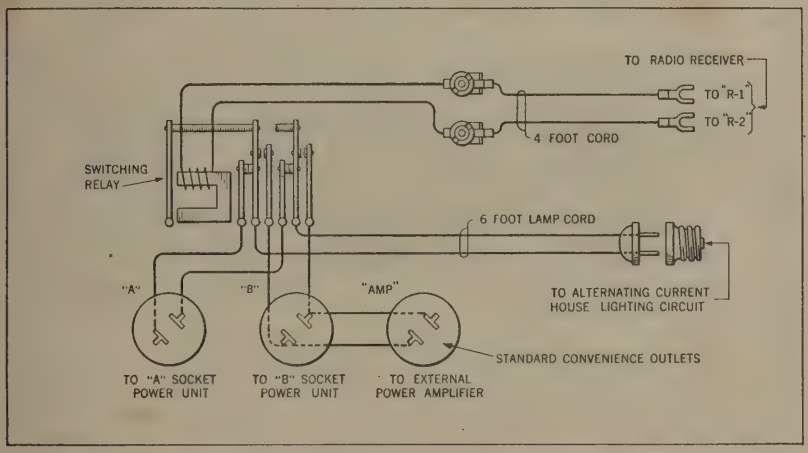


Fig. 24—Internal Circuit of the No. 301-A Power Switching Relay

if a "B" Current Supply Unit is plugged into the outlet marked "B," plate current will be made automatically available for the operation of the receiver. Also, if an external super-power amplifier is plugged-into the outlet marked "AMP," this amplifier will be automatically connected for service.

The act of turning-on the filament switch, Fig. 18, connects the 6-volt "A" battery of the "A" Socket Power Unit to the Radio Receiver, doing away with the built-in switch that is usually incorporated in most of the "A" Socket-Power Units. **Thus, it is necessary that the "A" Socket-Power Unit selected be minus this self-contained switch,** as for example the Gould AC-6 Unipower, when furnished **without** the Gould master control switch.

The No. 301-A Power Switching Relay is designed to operate efficiently with the mounting lugs (Fig. 23) resting down on a horizontal surface. If permanently installed in a radio cabinet, it should be fastened down by wood screws, passing through the holes in the mounting lugs.

§ 22—INSTALLING THE CURRENT SUPPLY APPARATUS

Figs. 25 to 30, inclusive, show convenient locations for the current supply units in the battery tray (Fig. 14) of the No. 602-B receiver or in the No. 61 radio cabinet table (Fig. 10) when the latter is used with the No. 601-B receiver. The actual wiring of these power units to the radio receiver terminal board is shown in circuit diagrams Figs. 3 to 8, inclusive. The wires for making these connections are furnished with each receiver, as described in Section 15, "Connecting Cable for External Apparatus."

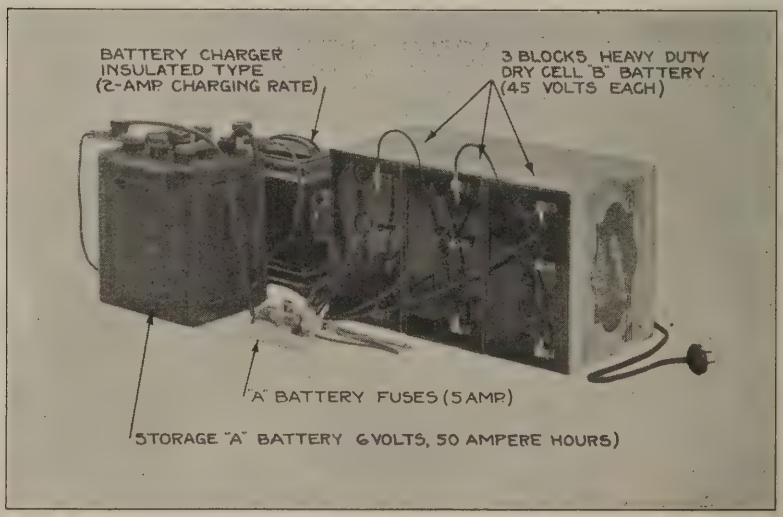


Fig. 25—Arrangement of Current Supply Apparatus for Circuit Fig. 3

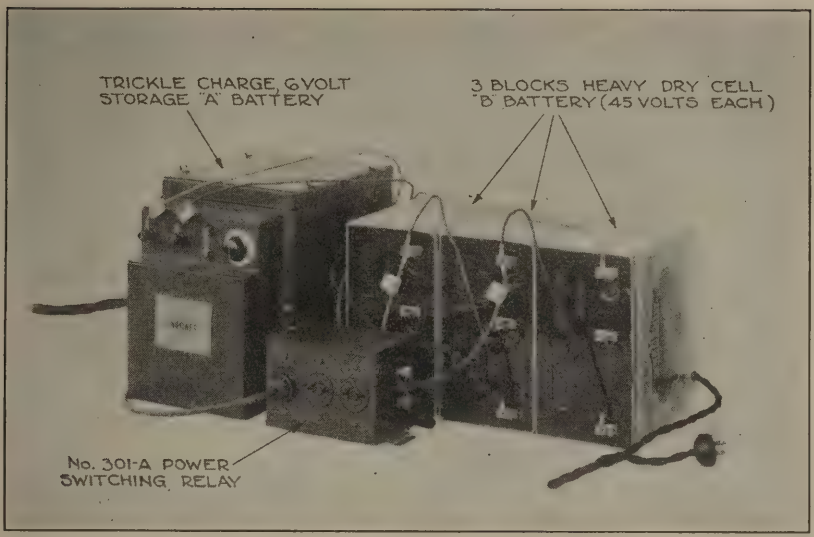


Fig. 26—Arrangement of Current Supply Apparatus for Circuit Fig. 4

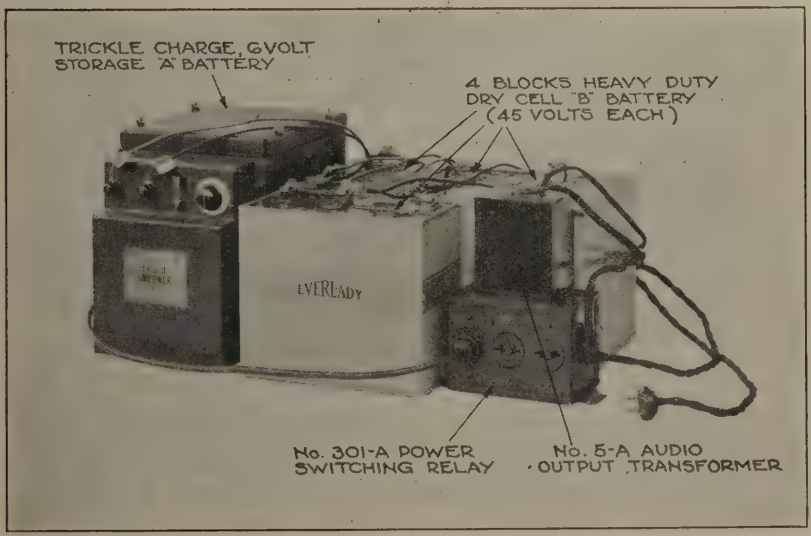
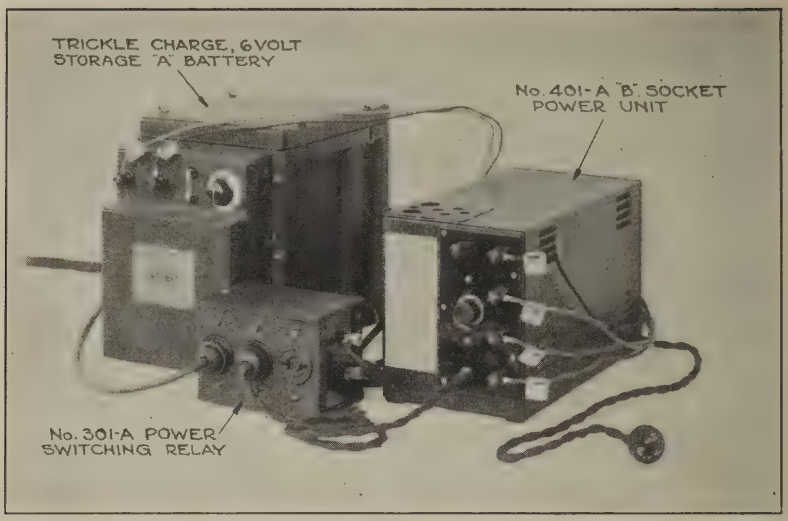


Fig. 27—Arrangement of Current Supply Apparatus for Circuit Fig. 5



Figs. 28 and 29—Arrangement of Current Supply Apparatus for Circuits Figs. 6 and 7

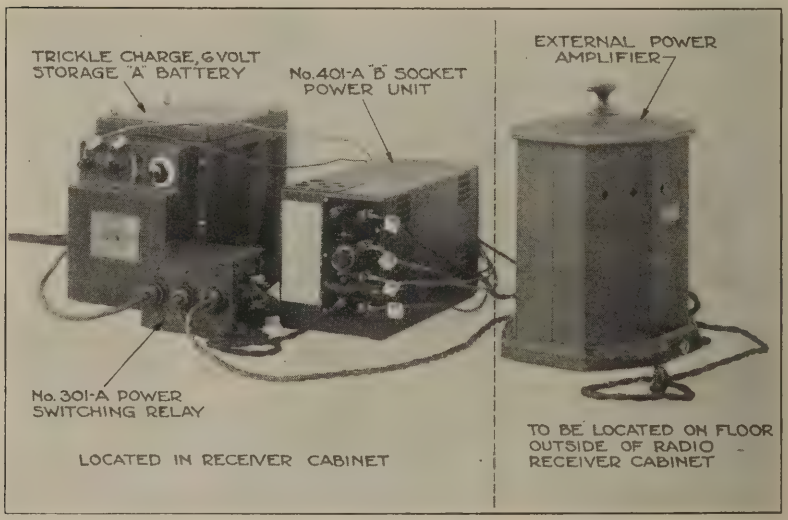


Fig. 30—Arrangement of Current Supply Apparatus for Circuit Fig. 8

It is necessary that the cabinet compartments for housing socket power apparatus be ventilated, to allow a circulation of cooling air for the vacuum tubes, etc. The No. 602-B receiver battery compartment and the No. 61 radio cabinet table, for use with the No. 601-B receiver, have ventilating openings in the rear panels for this purpose.

In general, it is advisable to place the "A" battery equipment in the left hand end of the battery compartment and the "B" batteries or "B" socket power units in the right hand end. This will avoid magnetic coupling with the audio amplifier apparatus of the radio receiver, when the latter is operated.

The No. 301-A Power Switching Relay has mounting lugs at each end to allow fastening to the bottom of the battery tray with wood screws. This unit should always be mounted in the position shown in Fig. 23, in order that the relay may operate efficiently.

When using an external power amplifier, such as the Western Electric No. 6025-B or the R. C. A. Uni-Rectron AP-935, the amplifier units should be located on the floor, outside of the radio cabinet, the power supply cord entering the radio cabinet through one of the rear panel ventilating holes and connecting to the No. 301-A Power Switching Relay, as shown in Fig. 8. The input cord of this External Power Amplifier Unit should terminate in a radio plug of standard A. M. E. S. dimensions (such as the Stromberg-Carlson No. 60 Radio Plug) and this plug should be inserted in the jack marked "EXTERNAL AMPLIFIER" on the terminal board of the No. 601-B or No. 602-B receiver as shown in Fig. 8 and

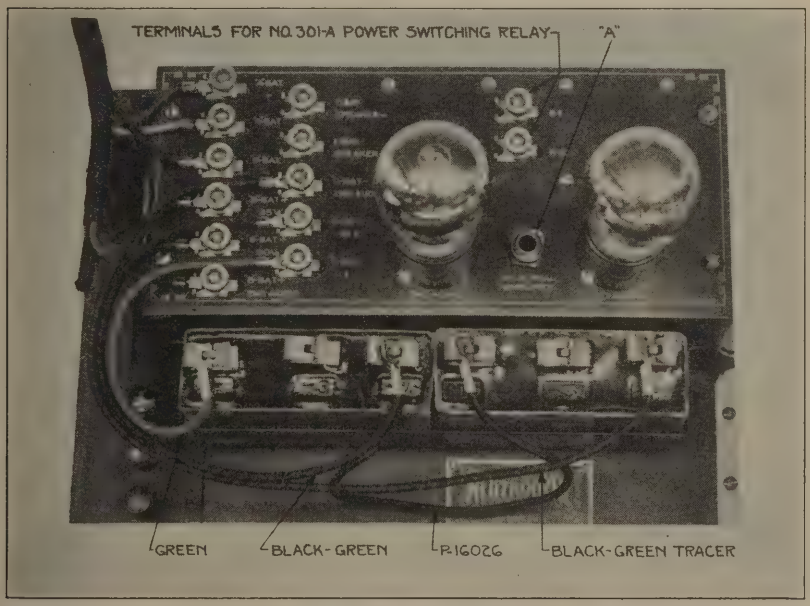


Fig. 31—Arrangement of 9-Volt "C" Battery for UX-112 Output Tube

at "A" in Fig. 31. When the plug is inserted in this jack, the second audio tube is not used and can be omitted in the second audio socket, also shown in Fig. 8. The No. 5-A Cone Speaker (or other loud speaker used) should go directly to the output terminals of the External Power Amplifier Unit, instead of to the "LOUD SPEAKER" binding posts in the radio receiver.

§ 23—VACUUM TUBE REQUIREMENTS

The Nos. 601-B and 602-B radio receivers require six genuine R. C. A. Radiotron vacuum tubes for satisfactory operation. Five of these tubes should be UX-201-A (required for the radio stages, the detector and the 1st audio stage) and one UX-112 or one UX-171 tube for the second audio stage. See Fig 11 for the correct location of these tubes in the receiver chassis.

The UX-112 tube gives about 2½ times the undistorted power output that can be obtained from a UX-201-A tube, when both tubes are operated with a 135-volt "B" battery, therefore, giving good volume on a Cone type speaker without the usual output tube distortion (rattle). The filament current of this tube is .5 ampere or twice that of a UX-201-A tube.

The UX-112 tube with 180 volts of "B" battery has an undistorted output of nearly six times that of the UX-201-A tube, when the latter is operated

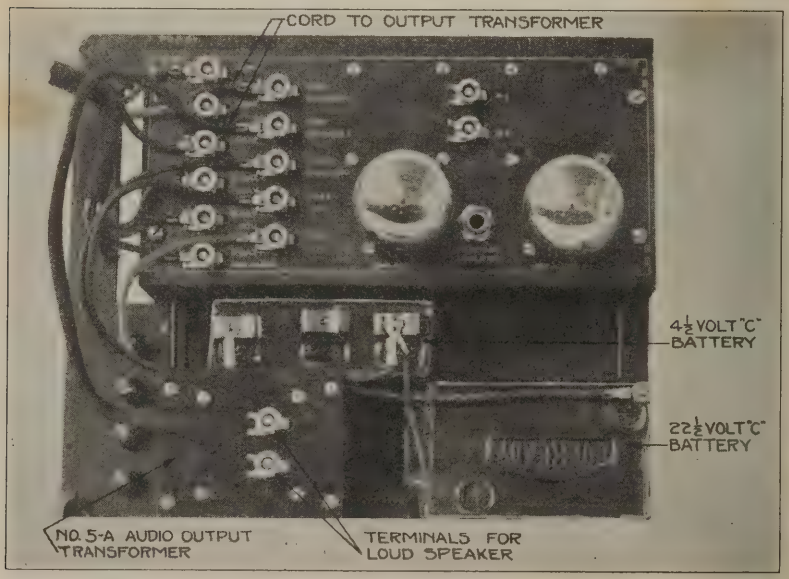


Fig. 32—Arrangement of 27-Volt "C" Battery for UX-171 Output Tube and Output Transformer

with a 135-volt "B" battery. An audio output transformer is required to protect the loud speaker circuit, when 180 volts of "B" battery is employed (See Fig. 5).

The UX-171 tube gives over 6½ times the undistorted power output that can be obtained from a UX-201-A tube, when both tubes are operated with a 135-volt "B" battedy. However, this UX-171 tube has the disadvantage that it requires about three times the plate current of a UX-112 tube and for that reason requires an output transformer to protect the loud speaker (See Figs. 7 and 32). The increased power of the UX-171 tube is necessary only where a greater volume of signal is desired on a high quality Cone type speaker. This tube requires the same filament current as the UX-112 tube (.5 ampere).

The use of a UX-201-A tube for the second audio stage is not recommended as its undistorted output, when operated with a 90-volt "B" battery is only one-eighth that of the UX-112 tube, when the latter is operated with a 135-volt "B" battery. Thus, if it is necessary to use the UX-201-A tube for a second audio amplifier to conserve battery current, or for any other reason, then it is advisable to employ a "filter" with a high quality cone speaker, or to use a horn type speaker which will not reproduce the high frequency "rattle" caused by the tube overload.

In order to obtain the maximum amplification, for which the Nos. 601-B and 602-B receivers are designed, the vacuum tubes should operate with the filament voltage set at 5 volts, as indicated on the voltmeter (Fig. 18) and with the plate or "B" battery voltages as follows:

(a) The Detector Tube (UX-201-A) 45 volts "B" Current Supply.

(b) Three Radio Tubes (UX-201-A) 90 volts "B" Current Supply.

(c) 1st Audio Tube (UX-201-A) 90 volts "B" Current Supply with 4½ volts negative bias "C" Battery.

(d) 2nd Audio Tube (UX-112) 135 volts "B" Current Supply with 9-volts negative bias "C" Battery or (UX-112) 180 volts "B" and 13½ volts "C," or (UX-171) 135-volts "B" Current Supply with 27 volts negative bias "C" Battery.

Greater undistorted power output can be obtained from the UX-171 tubes by using higher voltages of "B" current supply and correct "C" battery voltages. For example, with 157 volts of "B" current supply and 34 volts "C" battery this tube will give nearly 60 per cent increase in undistorted power output over that obtained when the same tube is operated with 135 volts "B" and 27 volts "C."

All vacuum tubes are fragile and **must be handled with extreme care to prevent damage to the inner elements.** The spacing of these elements is made close, in order to obtain electrical efficiency, and unless accidentally dropped or otherwise mechanically damaged, the accuracy of this spacing will be maintained indefinitely.

A slight displacement of the internal tube elements, that would not cause actual short circuiting of the plate to the grid or the grid to the filament, might decrease the electrical efficiency so that the receiver will not operate correctly. On the other hand, internal short circuits in the tubes may damage the receiver wiring or run down the batteries. Therefore, test each tube when inserting in the receiver, as explained in the next section of this book.

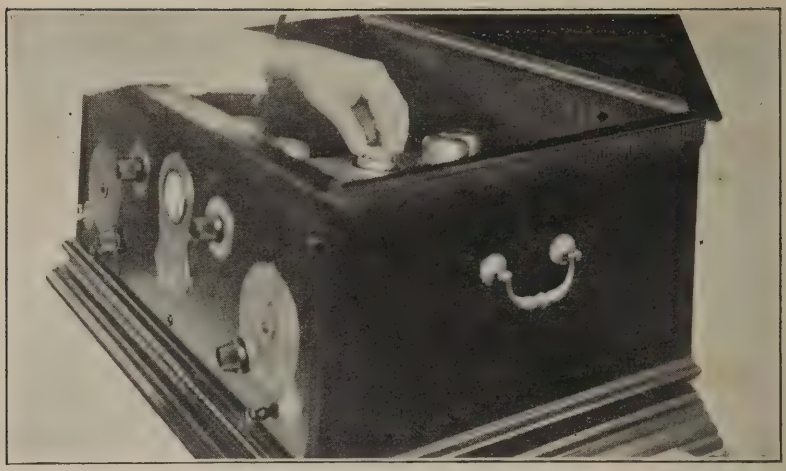


Fig. 33—Inserting Vacuum Tubes in Sockets of Shielded Compartments in No. 601-B Receiver

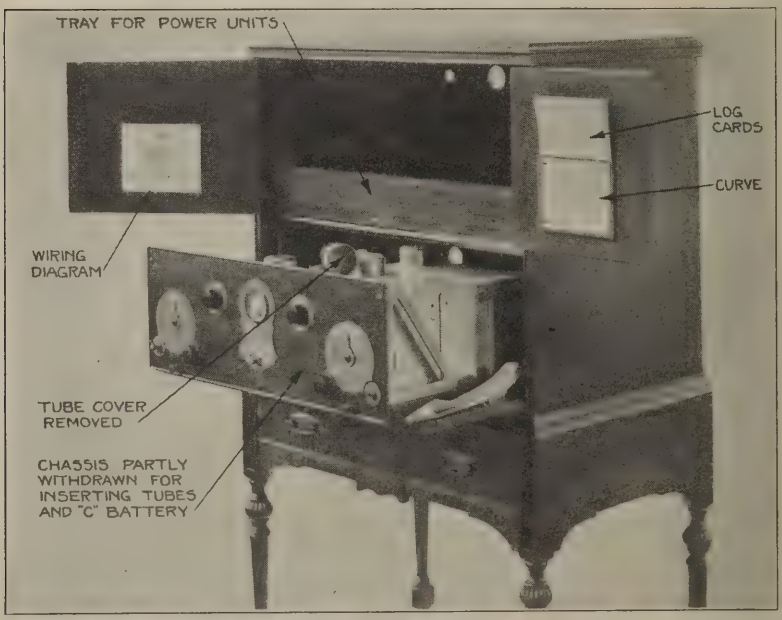


Fig. 34—Chassis Pulled Out of No. 602-B Receiver Cabinet for inserting Vacuum Tubes and "C" Battery

§ 24—INSERTING VACUUM TUBES INTO THE RECEIVER

To insert the vacuum tubes in the No. 601-B radio receiver, raise the top cover of the cabinet and remove the metal caps (shown at "A" in Fig. 11) from each shielded compartment. The contact pins of the UX-201-A type tubes (Push-pin type) then can be inserted into the holes in the shelf panel inside of each compartment, as shown in Fig. 33. The two large prongs of the tube should be located toward the near (or adjacent) end of the shielding box.

After the tubes are inserted, all of the metal caps of the radio stages should be carefully replaced in the same positions from which removed, the cap having the four inner spring fingers, being inserted in the top of the **rear right hand shield** (detector compartment).

The audio amplifier tubes are placed in the sockets marked "1st AUDIO" and "2nd AUDIO" as shown in Figs. 11 and 35. The 1st AUDIO Socket should be fitted with a UX-201-A tube and the 2nd AUDIO Socket with a UX-112 or UX-171 tube as specified under "Vacuum Tube Requirements."

In placing the tubes in the No. 602-B receiver, the same procedure is followed, except that instead of lifting the cover of the receiver, the entire chassis is pulled out to the front of the cabinet as shown in Fig. 34, in order to make the tube covers accessible. Two knobs, shown at "C" and "C" in Fig. 9 are provided to facilitate the pulling out of the chassis for inserting tubes or installing "C" batteries. When pulling the chassis fully out of the No. 602-B cabinet, take care that the surface of the drop shelf is not marred. Placing a folded newspaper the **full length and front edge** of this drop shelf (Fig. 34) will protect the surface from damage.

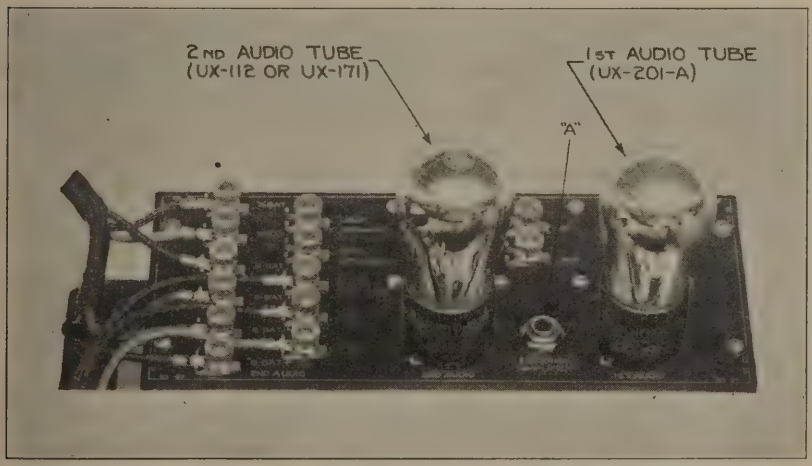


Fig. 35—Correct Location for Audio Amplifier Tubes, the 2nd Audio being to the left. External Amplifier Jack also is shown

If the fuses in the storage 'A'" battery or the "A" socket power unit circuits are "blown" (burnt out) when inserting a new vacuum tube in the receiver, it is a sign that the tube is defective, probably due to rough handling after leaving the factory or the dealer's store. Also, if a tube fails to operate properly or flashes when inserted in a tube socket, it may indicate that the plate and grid electrodes are short circuited within the tube.

Tubes that fail to operate correctly should be removed immediately from the receiver so as not to run down the dry cell "B" batteries if the latter are used. **It is a safe rule to make a preliminary test of all new tubes, by momentarily inserting one tube at a time into the 1st AUDIO Socket,** (Fig. 11) with no tubes in the remaining five sockets, to observe the action of the tube as to lighting (if a dim light can be seen through the silver coating of the glass bulb) and any other indications as to the tube condition previously given, before inserting these tubes into the remaining sockets. Be sure that the VOLTAGE CONTRTOL is turned fully down, "counter-clockwise," when a tube is inserted for test, and quickly remove from the socket as soon as the condition of the tube is noted, to avoid overvoltage damage.

§ 25—SELECTION OF NON-MICROPHONIC DETECTOR TUBE

The internal elements of some vacuum tubes, especially when used for detector purposes, are sensitive to external jars or vibrations that may be transmitted through the air from a nearby loud speaker, resulting in a continuous low or a continuous high pitched tone.

This action is called "Acoustic Coupling" and is accentuated when a powerful Cone type speaker is used and when the receiving set and loud speaker are both located in a critical position in a room that has practically all of the walls, floors and furnishings of hard non-resisting materials, which easily reflect sound. The presence of rugs or other floor coverings, drapes or other soft wall coverings, upholstered furniture, or even the presence of a number of people in the room, tends to prevent these sound reflections or echos, and besides reducing the possibilities of acoustic coupling, give naturalness to the reproduction in the loud speaker.

However, in all cases it is advisable to select a "non-microphonic" tube for the detector socket of the receiver, as follows:

After all six of the tubes are in place and lighted, and with the loud speaker connected, lightly tap the tube in the detector socket (rear right hand socket as shown in Fig. 11) with the nail of one of your fingers and notice the resulting sound in the the loud speaker. If it is a prolonged vibrating note, the tube is too microphonic for a good quiet detector. On the other hand, if the resulting note sounds like a "Klink" or a vibration that quickly dies out, the tube will be acceptable for detector purposes.

It is a good plan to try all of the tubes suitable for use in the detector socket, in turn, by shifting from socket to socket until the least microphonic tube is selected for the detector. In changing tubes from socket to socket, it is advisable to turn the battery switch, shown in Fig. 18 to the "OFF" position before the tube is removed, and not turning it on again until the tubes are replaced in all sockets. This disconnects the "A" battery current while the transfer of tubes is being made.

When making the final test for "acoustic coupling" be sure that the tube cover having the four inner spring fingers is placed over the detector tube (rear, right hand shielded compartment) and that the receiver cabinet top is closed, if a No. 601-B receiver, or that the chassis is completely pushed into the cabinet, if a No. 602-B receiver.

If the loud speaker is provided with a long cord, such as furnished on the Stromberg-Carlson No. 5-A Cone type speaker, (See Section 47 and Fig. 54) so as to be located a distance from the receiving set, it is usually possible to find a location where the acoustic coupling will be at a minimum or where no audible disturbing tone will be reproduced. **Changing the location of the loud speaker only one or two feet from a position where acoustic coupling exists, often will completely overcome this disturbance.**

§ 26—SELECTION OF THE RADIO AMPLIFIER TUBES

For best results, good sensitive Radiotron UX-201-A tubes should be used in the three radio amplifier sockets (Fig. 11) and the selection of these tubes should follow the picking of a non-microphonic detector tube. This selection can be made by tuning in a fairly weak broadcast signal and changing around the tubes suitable for use in these sockets (not disturbing the previously selected non-microphonic detector tube), readjusting the STATION SELECTORS for maximum signal each time a change of tubes is made, until the best combination of tubes is found. When making these tests always have the voltmeter pointer set at the 5-volt division and the tube covers "A," Fig. 11, inserted in the shield tops. Once the best location for the tubes has been selected, it is a good plan to always leave them in the same sockets. Labeling all tubes in the receiver with the socket locations, will insure that they can be replaced in the same positions, if, at any future date they are removed for any reason. In selecting tubes, a defective tube may be located by having an extra tube on hand and successively exchanging with each tube in its socket until the defective one, if any, be located.

When changing tubes be sure to turn the filament switch (shown in Fig. 18) to "OFF" until such time as all tubes are replaced.

§ 27—USEFUL LIFE OF VACUUM TUBES

The life of the tubes recommended for this receiver is from 1,000 to 2,000 hours of intermittent use, if not abused by rough handling and if subjected to not more than 5 volts on the filament at such times as the receiver is in use. Therefore, it is economy not to turn up the VOLTAGE CONTROL more than necessary to give a good volume and quality of signal, **always keeping the voltmeter pointer to the left of the red mark on the scale.**

Excessive voltage on the tube filaments will not increase the signal strength any appreciable amount above the signal obtained when the tubes are worked with the voltage within the safe limit specified, but on the other hand will greatly reduce the operating sensitivity of the tubes and cut the active life to a small fraction of that given above. For example, a 10% increase in filament current may cause as much as 50% decrease in useful life of the tube.

The end of the useful life of the vacuum tubes is indicated by lack of sensitiveness or a rattling noise in the cone speaker, rather than failure of the filament to light. When making a test for sensitiveness, be sure that the voltmeter reads 5 volts and that the "C" battery is new and correctly connected to the receiving set and that the "B" current supply is full voltage, whether dry cell "B" batteries or a "B" socket-power unit.

Then repeat the tests, previously given, for selecting tubes for a new receiver, and tests for defective tubes.

§ 28—LOCATION OF RADIO RECEIVER

The No. 601-B or No. 602-B radio receiver can be located in any convenient position in any room in a building. When there is a choice of several positions, it is best to select a location that will favor the easy pick-up of the broadcasting station signal.

If an outdoor antenna and a ground connection are used for the radio receiver pick-up, it is advisable to favor a location as close to the point where the antenna enters the building as possible. Thus, the signal collector will be in a favorable position to pick-up broadcasting signals and only a short length of antenna or lead-in wire will be located inside the building to be exposed to local electrical noises.

If the No. 601-B or No. 602-B receiver is used with a loop type of pick-up, care must be taken to select a position in the room where the loop will not be shielded from the broadcasting station signal by metal lathing in the walls, concealed pipes, radiators, etc. The best location for a loop type of pick-up is determined by experiment, testing the reception of the desired broadcasting signals with the receiver in various positions in the room. Usually a position near a window opening gives best results. See Section 37 on "Operating the No. 601-B and 602-B Receivers with a Loop."

The intelligent location and correct installation of an antenna type of signal collector, to fit the local pick-up conditions and the amount of amplification provided in the receiver, will insure operating satisfaction. Therefore, this subject of antennas is treated in detail in the following articles.

There are locations where it is not possible to install an efficient antenna and where nothing but local or medium distant stations can be picked-up, due to congestion of local programs. Here it may be found that a loop type of signal collector will give more satisfactory service than an inside antenna or an unfavorably located antenna. Instructions for the installation and operation of a loop type of pick-up on the No. 601-B and 602-B receivers follow the instructions covering antennas. See Sections 36 to 39, inclusive.

§ 29—CHOICE OF ANTENNA AND LOCATION

The employing of three stages of tuned radio frequency amplification in the Nos. 601-B and 602-B receivers allows the antenna to be comparatively short and of single wire construction. By a short antenna, we mean one of from 20 to 50 feet total length, from the end of the antenna to the radio receiver, provided the lead-in is not shielded by steel buildings or metal roofs. When a long antenna is referred to, one of 50 to 70 feet total length is meant.

An antenna should be at least 15 feet and preferably higher, above a metal roof or steel frame building. If lower than this or shielded by steel building, a greater length may be necessary to secure ample signal volume.

It should always be borne in mind, particularly in cities where there are a number of broadcasting stations, that a short antenna will give much better selectivity than a long antenna, and if properly located in an unshielded position, will give a good volume and distance.

The choice of the antenna length varies with the location of the receiving set and the conditions encountered:

(a) If the receiver is located in a district where there are a number of nearby broadcasting stations, it is best to use a comparatively small antenna (20 to 50 feet) in order to get maximum selectivity.

(b) If the receiver is located where there are a very few or no local broadcasting stations, it is permissible and desirable to use a longer antenna (not over 80 feet total length) in order to take advantage of the louder signals and greater distances obtained.

The choice of the location for the antenna also regulates the length or size:

(a) If the antenna is to be located inside a house or building and is not shielded by steel framework, metal lathing or metal roofing, then a short wire of not more than 20 or 50 feet long can be used for installation convenience and for maximum selectivity.

(b) If the walls or roof of the building in which an inside antenna is to be installed contains metal, then the "pick up" wire must be long and kept away from the walls adjacent to where the antenna is supported.

(c) Where the building is shielded, as described in the previous paragraph, and local electrical (static) noises are generated inside the building by motors, or other electrical apparatus, it is best to use an outdoor antenna **with as short a length of lead-in wire inside the building as possible.** This cuts down the effect of the inside disturbing noises and allows ample pick-up for distant signals.

When the receiving set owner desires to be in position to take advantage of both the short and the long types of antennas, a single pole, double throw switch can be installed at some convenient point between these two antennas and the wire leading to the radio receiver as shown in Fig. 41. Under normal conditions, the receiver can be left connected to the short antenna and only when extreme distant stations are desired, or the receiving conditions are unfavorable need this switch lever be thrown to the long antenna.

If an outdoor antenna is to be installed by the owner of the radio receiver, it is best to become acquainted with the section of the "National Electrical Code" dealing with radio receiving set installations, so as to comply with the rulings. These rulings do not include the installation of a radio receiver when all of the wiring of antenna and ground is located within the building.

§ 30—PICTURE MOULDING ANTENNA

When the installation of the No. 601-B or No. 602-B radio receiver must be confined to the one room or a small apartment, good results may be obtained by the use of an antenna placed around the picture moulding, **provided the outer walls of the building are not of metal or metal lathed or the building of steel frame construction and there are no disturbing electrical noises generated inside the building.** See Sections 42 and 43. Single conductor rubber covered and braided interior telephone wire (No. 19 B & S gauge) or single conductor lamp cord (No. 18 B & S gauge) will be suitable for this type of antenna.

When selecting the location for the radio receiver, preference should be given a position at one end or corner of a long room or hall, in order to get the maximum "effective length" of antenna.

The bare end of the single conductor rubber covered antenna wire should go through the hole "T" provided in the back of the receiver cabinet (Figs. 12 and 13) and be attached to the binding post marked "ANT," the

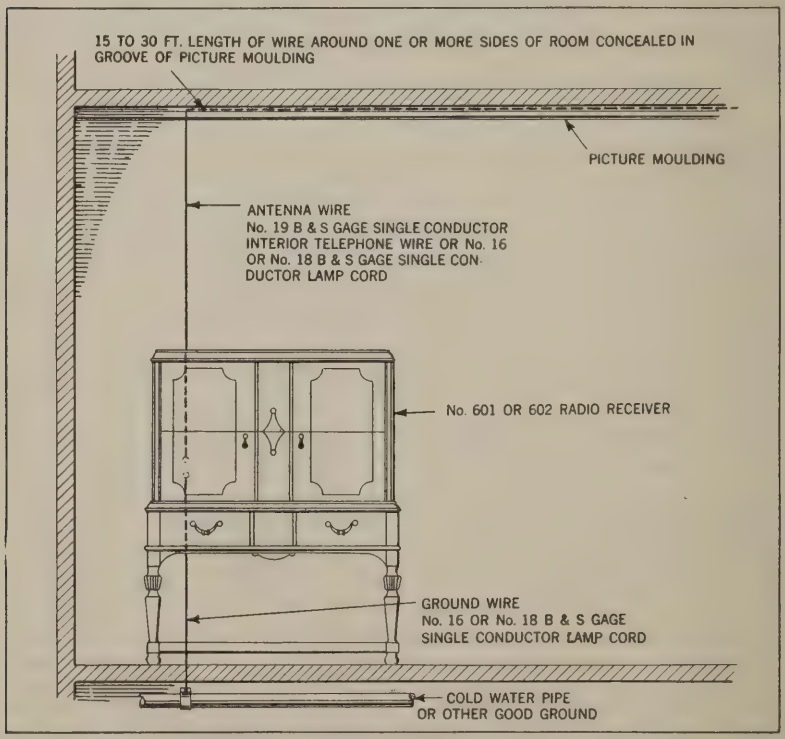


Fig. 36—Picture Moulding Antenna. Used when the room is not shielded by metal framework or metal lathing

free end of the wire running up to and around the picture moulding, as shown in Fig. 36.

Small pins or staples can be used to hold this wire concealed in the groove in the picture moulding. This type of antenna can be carried along the picture moulding to the diagonal opposite corner of the room, or carried completely around the four sides of the room.

Never allow excess length of antenna or other external wiring to be stored inside the receiver cabinet. Always have these wires run straight from the binding posts to the holes in the rear of the cabinet. Avoid running the antenna wire close to other electric wires or close to metal electric lighting fixtures as losses in signal strength or the introduction of interfering noises may result.

The type of wire for connecting the ground binding post (marked GND) of the receiver to the nearest cold water pipe can be the same as that used for the picture moulding antenna. Use a good ground clamp for attaching this ground wire to the water pipe, being sure to scrape all paint, enamel or rust from the pipe before attaching the clamp. Any joints in the antenna or ground wires should be soldered, if possible, thus insuring a permanent job.

It is advisable to tag or otherwise mark the antenna wire and the ground wire, adjacent to the receiver location, so that if these wires are disconnected at any time, they can be correctly replaced. In some installations, the usual ground connection to pipes or radiators may act to pick-up local electrical disturbances and produce "noise" in the loud speaker. A counterpoise ground, as described in Section 35, often will overcome this objectionable noise pick-up.

§ 31—ATTIC ANTENNA

The Nos. 601-B and 602-B radio receivers will give excellent results for distance and selectivity with an attic antenna of two parallel horizontal wires, between 15 and 20 feet long, spaced about 2 feet apart, as illustrated in Fig. 37, providing these wires are not located under a grounded metal roof. This antenna wire can be regular No. 19 B & S gauge interior telephone wire or copper wire of larger cross section.

Porcelain knobs can be used at each end of these horizontal antenna wires for support, care being taken that these wires do not come close to metal pipes or electric light wires.

The ends of these two horizontal wires, directly above the place where the radio receiver is to be located, should be connected together with a piece of No. 19 B & S gauge interior telephone wire, or other rubber covered and braided wire, and this wire carried directly down to the receiving set. All joints in the wire should be soldered for permanency.

It is best to keep this wire connecting the antenna to the receiver, inside the house, so that no protector (Lightning Arrester) will be required. An electrician can make a neat installation by carrying this wire down through walls and thus be completely concealed. In no case should the wire be run through a metal pipe or metal conduit, although non-metallic "loom" will serve as extra insulation and is advisable. A wall receptacle and attachment plug can be used where this antenna connecting wire comes through the wall to the room in which the receiving set is to be located.

The radio receiver should be placed as close as convenient to the point where this antenna connecting wire enters the room.

The ground connection from the GND binding post to the radio receiver should be made to the nearest cold water pipe or other grounded metal part of the building, as described in Section 34, or a counterpoise ground installed (See Section 35).

If the available attic space is 30 or 40 feet long, a single horizontal wire antenna can be used in place of the two parallel wires. Porcelain knob insulators can be used at each end and one in the middle, if required to keep the wire from sagging. The remainder of the installation should be just as described for the two-wire attic antenna.

In place of a single or double wire attic antenna, this No. 601 or No. 602 receiver will operate satisfactorily with a "pick-up" made from a piece of copper or bronze wire window screening about 3 feet by 10 feet, arranged as shown in Fig. 38. It is advisable to solder a bare copper wire along the bottom of this screening and to this bare wire attach and solder the wire leading down to the radio receiver.

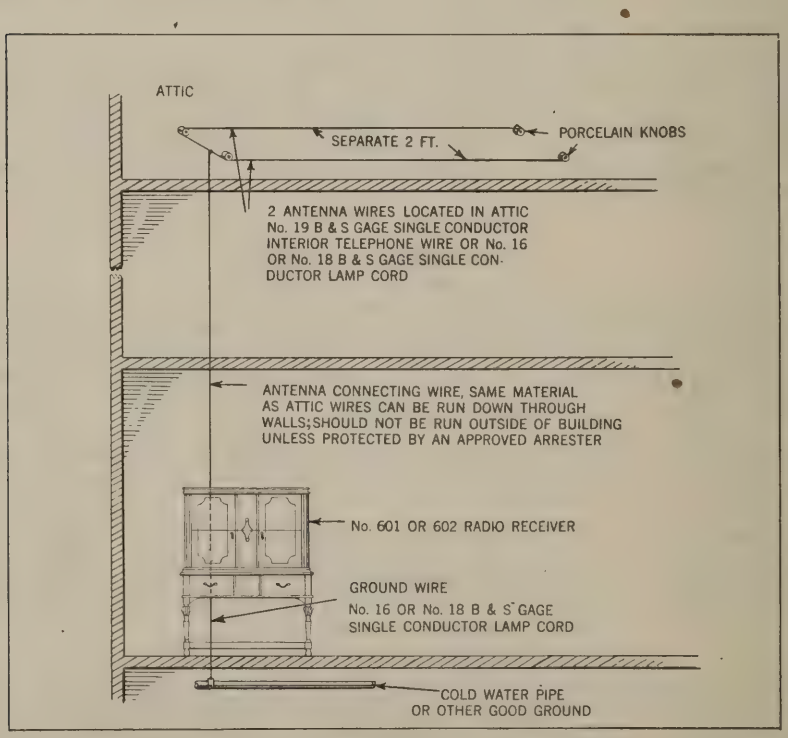


Fig. 37—Attic Antenna. Used where the roof of the building is not covered with metalwork

§ 32—OUTDOOR ANTENNA ON RIGID SUPPORTS

If it is desired that an outdoor antenna is to be used, there are four important precautions to be observed:

First—See that the antenna wire is not placed over or under any other wires, such as electric light, telephone or telegraph wires. This is to avoid contact between antenna wire and one of the other wires, if a wire should break loose and fall. These other circuit wires may carry dangerous electric voltages.

Second—Select firm supports for both ends of the antenna wire and make sure that the fastening of the antenna to the supports is sufficiently secure to withstand high winds and heavy sleet if located in a cold country.

Third—Use a protector (lightning arrester) that is approved by the "National Electric Code" and see that it is correctly installed and connected to an approved "ground."

Fourth—Be sure that the antenna and lead-in wires are well insulated from the supports and from all foliage or limbs of trees and that these wires do not run close to conducting objects, such as metal pipes, metal roofs, metal water spouts, etc.

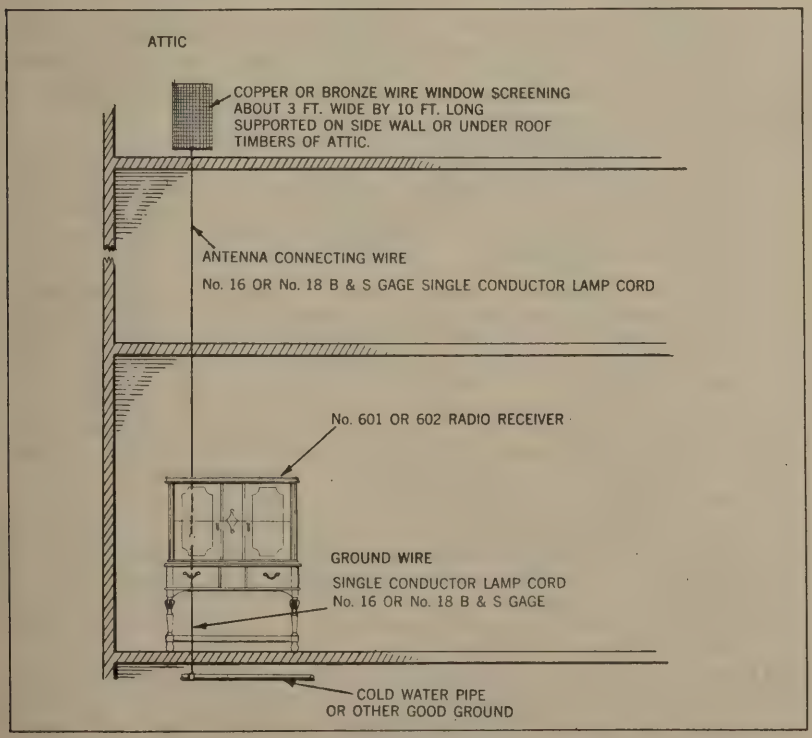


Fig. 38—Attic Antenna, using window screening for Pick-up

The following is a list of materials suggested for an outdoor type of antenna, such as will be suitable for use with the No. 601-B and No. 602-B radio receivers (Stromberg-Carlson No. 2 Antenna Outfit or equivalent):

100 ft. No. 14 B. & S. Gauge Enameled Copper Antenna Wire.

50 ft. No. 14 B. & S. Gauge Rubber Covered and Braided Copper Wire, for lead-in and ground connection.

25 ft. No. 18 B. & S. Gauge (or larger cross section) Rubber Covered and Braided Copper Wire (single conductor lamp cord will do) for connecting the receiving set to the arrester.

2 Antenna Strain Insulators of Glazed High Grade Porcelain or "Pyrex" Glass.

3 Split Porcelain Knobs with screws, for fastening lead-in wire to side of building.

1 Approved Ground Clamp, for attaching the ground wire to a water pipe or other suitable ground connection.

1 Porcelain Tube, 8 inches long by 9-16 inch outside diameter, for insulating the lead-in wire when it passes through wall of building.

1 Protector (Lightning Arrester) of "Underwriters" aproved design.

2 Large Screw Eyes, for fastening ends of antenna to supports.

12 Insulated Staples, for attaching inside wire to woodwork.

The installation of an outdoor antenna, mounted on rigid supports, can proceed in the following order and as shown in Fig. 39.

(a) The large screw eyes for holding the antenna wire can be screwed into the supports so as to give a separation of between 30 and 50 feet. The height of these screw eyes will determine the antenna wire height, which should be ample to clear obstructions, say between 20 and 40 feet above the earth or 10 to 20 feet above the roof of a building.

(b) Now cut two short pieces (about 3 feet long) from the end of the coil of antenna wire for fastening the strain insulators to the screw eye supports. Secure one end of each piece of this wire to an insulator by passing it through the hole or eye in the insulator and then twisting the wire tightly around itself for five or six turns, as shown in Fig. 39. The other end of each of these wires is inserted through the holes in the screw eyes and twisted tightly around itself for five or six turns, thus making the insulators secure to the supports.

(c) The remaining antenna wire is to be fastened between the two strain insulators so as not to come in contact with the two short supporting wires mentioned in the previous paragraph. This is best done by first passing the end of the antenna wire that is to be farthest from the receiving set, through the unoccupied hole in the strain insulator and then to twist tightly around itself five or six turns.

(d) The other end of the antenna wire is passed through the unoccupied hole of the second strain insulator (the one nearest receiving set location) and twisted tightly around itself for five or six turns, after the antenna wire is drawn up taut. This

should leave a piece of antenna wire already attached to the antenna proper and sufficiently long to serve as a lead-in wire to the protector location.

(e) The lead-in wire (extension of the antenna wire) should be run to the point where it is to enter the building without touching metal work or even the woodwork. Use one or more of the split porcelain knobs for providing this insulation from the building and the 8-inch porcelain tube to insulate the opening through which the wire enters the building.

(f) The hole for this porcelain tube can be bored with a 5-8 inch diameter bit through the woodwork of the wall or window frame. When boring this hole, have the bit slant downward towards the outside of the building. This will prevent rain from entering through the bushing. Insert the bushing through this slanting hole with the large end of the bushing inside the building to keep it in place.

(g) The lead-in wire should be fastened to the outside wall or window frame, a few inches above the outer end of the porcelain tube, with one of the split porcelain knobs. This will allow the lead-in wire to be looped down below the outer end of the porcelain tube and serve as a water "drip loop" and carry rain away from the tube end.

(h) The protector is best located inside the building, immediately below the inner end of the porcelain tube, as shown in Fig. 39, so that the lead-in wire can be fastened directly to the top binding post of the arrester. The "National Electrical Code" requires that the protector "shall not be placed in the immediate vicinity of easily ignitable stuff, or where exposed to inflamable gases or dust or flyings of combustable materials."

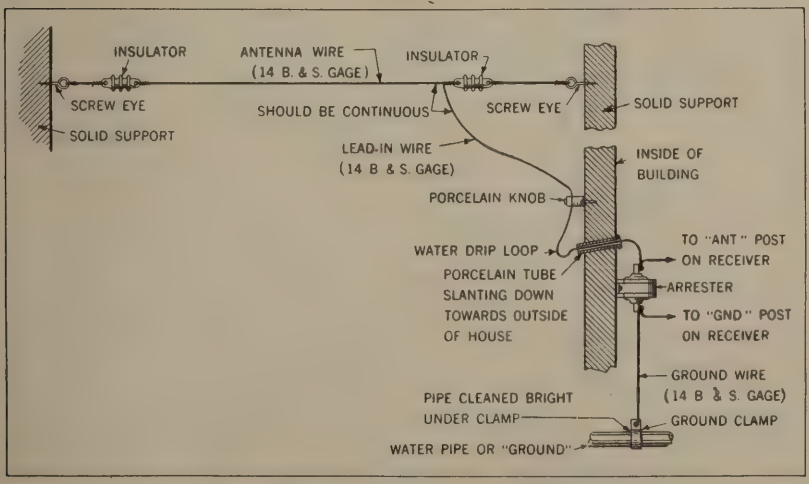


Fig. 39—Outdoor Antenna on rigid supports

(i) The protector ground connection should be made with the No. 14 B. & S. gauge rubber covered and braided, copper wire. (It must not be smaller conductor than the lead-in wire). Cut and scrape the insulation from one end of this wire and fasten it to the lower (unused) binding post of the protector and run this wire by the most direct and shortest route to a good reliable ground. If there is a cold water pipe nearby, it will serve as a good ground, the connection to the pipe being made with the ground clamp. **Be sure to scrape all paint or bronze enamel from the metal of the pipe at the point where the ground clamp is to be located.** Set the clamp screw tight enough so that it will be impossible to twist the clamp on the pipe by hand. Cut the ground wire the right length to just reach the ground clamp and fasten its bared end securely under the nut of the clamp screw.

Other protector grounds permitted by the "National Electrical Code" are steel frames of buildings or other grounded metal work in the building, and artificial grounds, such as driven pipes and rods, as shown in Fig. 40, plates, cones, etc., located in moist earth. The use of gas pipe as a ground is prohibited by the "National Electrical Code."

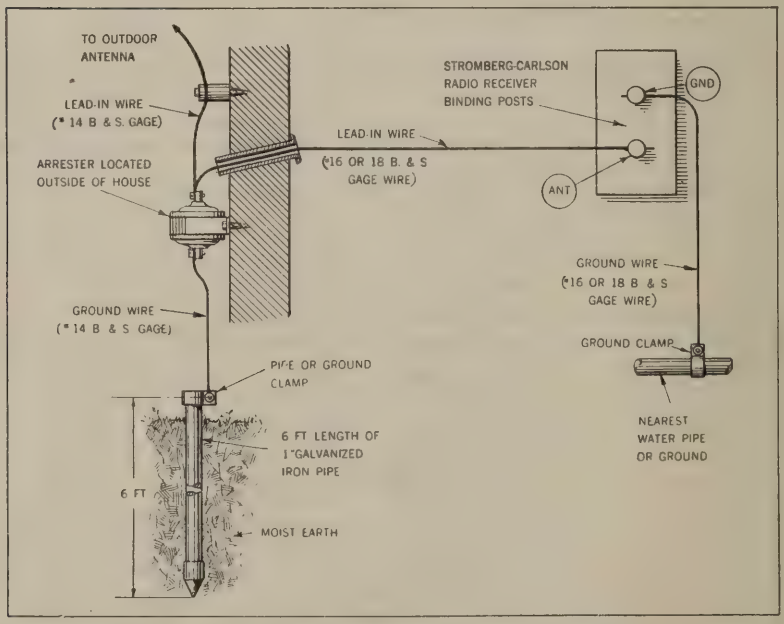


Fig. 40—Separate Grounds for Arrester and Receiver. Used when an outside Antenna is employed and the Receiver is located at a distance from the Arrester, also when the Arrester is located outside the building

(j) The connection from the protector to the No. 601-B and No. 602-B radio receiver can be made with the No. 16 B. & S. gauge rubber covered and braided copper wire (single conductor lamp cord will do). The distance from the protector to the receiver should be kept as short as possible. Remove the insulation from one end of the No. 16 wire and fasten securely to the same binding post of the protector that the lead-in wire is fastened (upper post). Connect the other end of the No. 16 B. & S. gauge wire (insullation removed) to the "ANT" binding post of the radio receiver.

(k) A second piece of the No. 16 B. & S. gauge rubber covered and braided copper wire should be used to connect the ground (GND) binding post of radio receiver with the binding post of the protector to which the protector ground wire is fastened, as shown in Fig. 39. This second wire should be kept separated from the first or antenna connecting wire by a distance of several inches for the entire length from the receiving set to protector. If a cold water pipe or other grounded metal work is close to the receiving set, it is advisable to run the ground wire by this shorter route to ground, as shown in Fig. 40 rather than by way of the protector ground wire.

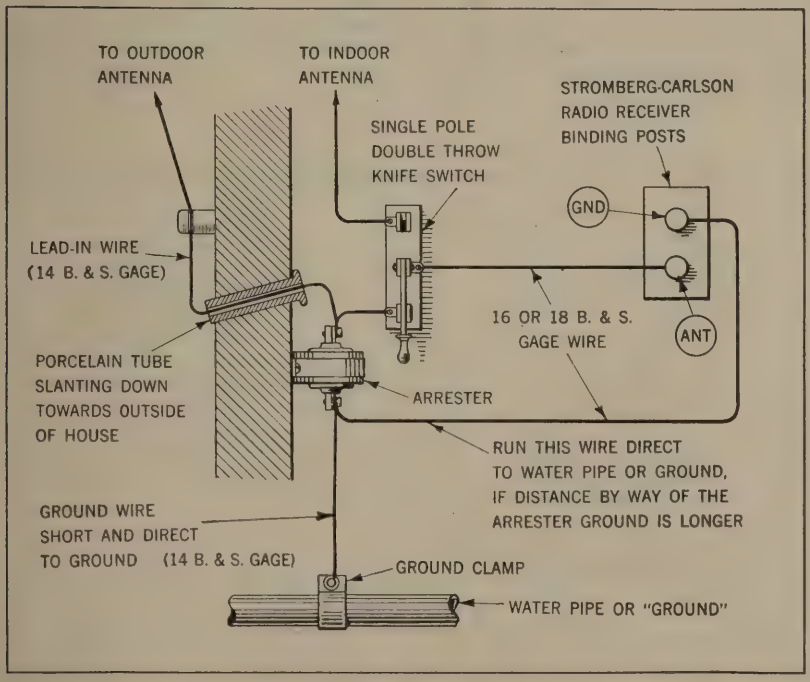


Fig. 41—Inside Ground for Arrester and Receiver, used when both Arrester and Ground are located close together. This allows a long outdoor or a short indoor Antenna to be used as desired

(l) The antenna installation just described has all joints between different wires made at the binding posts on the protector. If the lead-in wire is not a continuation of the antenna wire, it should be securely fastened by wrapping tightly around the antenna wire and **soldered.**

(m) In some cases it is not permissable to drill a hole through the side of a building or window for the porcelain tube used for the lead-in wire. Heavily insulated approved "window strips" have been used for this purpose with success. These stripes are designed to be placed flat on the window sill and the window closed down, without damaging the insulation of the strip, provided the window fits its frame not too tightly. A tightly fitting window or a window having metal weather strips will interfere with making a good installation. Window strips should never be used where grounded metal sash or grounded metal window frames are encountered.

(n) Another (temporary) scheme for bringing the antenna into a building is to place a narrow wooden strip between a raised sash and the bottom of the window frame and in this wooden strip to insert the porcelain bushing for the lead-in wire.

If the radio receiver owner wishes to obtain the advantages of both the short and the long antennas, the two types can be installed, the long antenna being an outdoor type and the short antenna the indoor type, using a single pole, double-throw baby knife switch, to connect either antenna to the radio receiver as desired. The correct wiring of this switch is shown in Fig. 41.

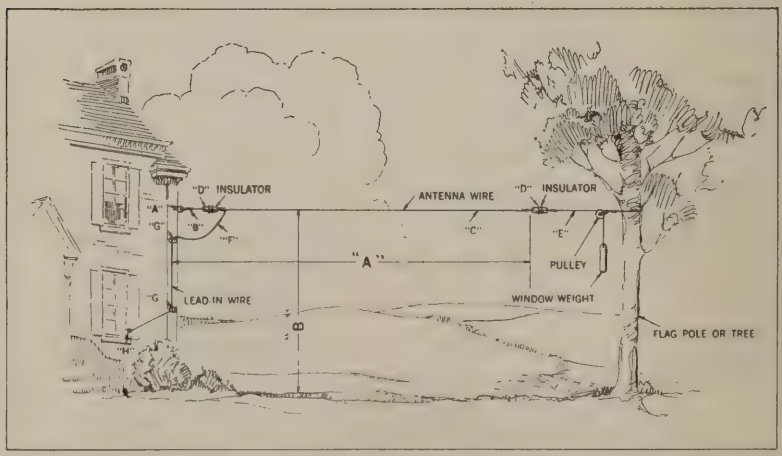


Fig. 42—Typical Installation of an outdoor Antenna, when one of the supports is flexible. Length "A" plus height "B" should not exceed 80 feet

§ 33—OUTDOOR ANTENNA ON FLEXIBLE SUPPORTS

If the outdoor antenna is to be attached to a tree or other support that can sway with the wind, the fastening should be made flexible, so as to hold the horizontal wire taught and yet remove undue strain from the wire itself. One satisfactory way to do this is by means of a counter-weighted cord operating over a suitable pulley as shown in Figs. 42 and 43, the material required being as follows:

1 Galvanized Iron or Brass Pulley 2 inches or 3 inches diameter with pulley groove of size suitable for a window sash cord.

50 ft. hard-woven cotton window sash cord.

1 Window Sash Weight (heavy weight as used on large windows).

The receiving set end of the antenna can be rigidly supported and the lead-in wire run as shown in Fig. 40 or 41, and as described in Section 32, "Outdoor Antenna on Rigid Supports."

The open end of the antenna wire (nearest the tree or flexible support) should be attached to the strain insulator by passing it through the opening in the insulator, doubling back and wrapping tightly around itself five or six times as shown in Fig. 43.

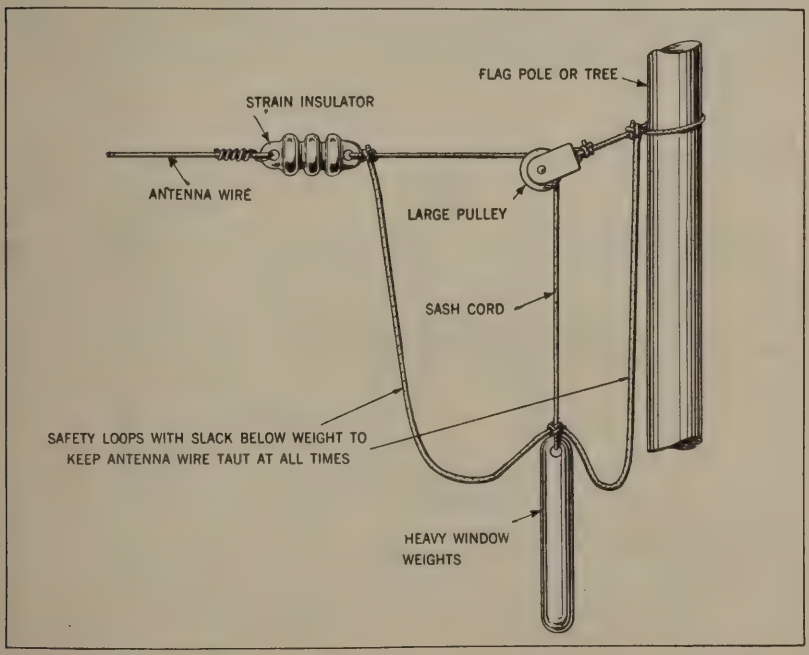


Fig. 43—Window Sash Weight for keeping slack out of Antenna Wire when one of the supports is flexible

Now, one end of the sash cord should be passed through the remaining hole in the strain insulator and securely tied, after which this cord can be threaded over the pulley wheel and the pulley frame fastened to the tree or other flexible support, using a piece of antenna wire for this fastening.

One heavy window sash weight should be attached to the free end of this antenna supporting cord, as shown in Fig. 43, the amount of weight being sufficient to hold the horizontal antenna wire taut.

When a tree is used as a support for an antenna, be sure that none of the limbs of the tree can swing with the wind and touch the horizontal antenna wire. It is best to have the sash cord support extend 8 or 10 feet outside the foliage of the tree in order to assure ample separation between the end of the antenna wire and the leaves or limbs of the tree.

When this arrangement is correctly installed, the swaying of the tree or flexible support will cause the weight to be raised and lowered while the antenna wire will remain practically horizontal and no undue strains be placed on the wire or its supports.

Another flexible fastening to a moveable support is illustrated in Fig. 44. Here, a long spiral spring of rust-proof metal is inserted between the flexible support and the antenna strain insulator, with a loop of sash cord to act as a safety fastening for holding the antenna wire from dropping in case the spring should be accidentally broken. The spring should be of sufficient strength to hold the antenna wire from undue sagging or swaying in a heavy wind.

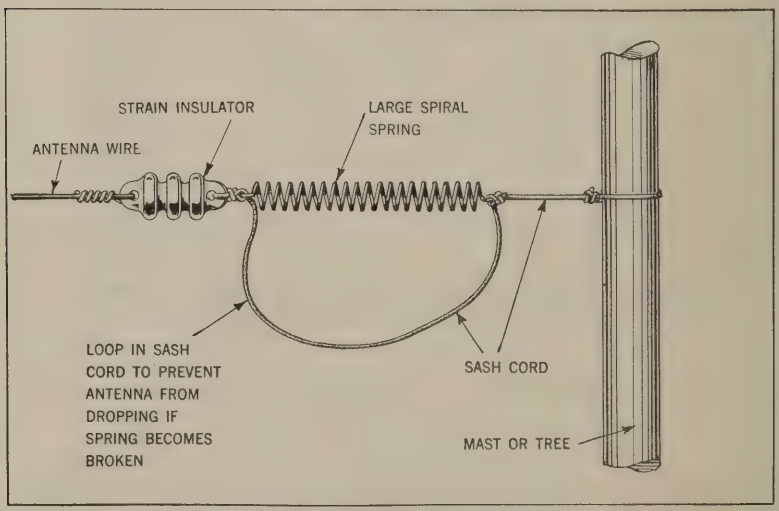


Fig. 44—A Special Spring for keeping slack out of Antenna Wire when one support is flexible

§ 34—GROUND CONNECTION FOR RADIO RECEIVERS

A good ground connection is essential to obtain the best results from the Nos. 601-B and 602-B radio receivers, therefore, this part of the installation should not be neglected.

If a cold water pipe is near the receiver location, it will serve as an excellent ground, the connection to the pipe being made through an approved ground clamp, as shown in Fig. 3. Be sure to scrape the metal surface of the pipe bright at the place where the clamp is applied to insure a reliable electrical connection.

Steel framework of buildings can be used for a radio receiver ground, but it is not highly desirable.

Heating system radiators can be used for receiving set ground connections, where no other connections are available, but seldom are efficient due to the high resistance joints between the radiator and the earth (ground) and may act as collector of electrical "noises." See Section 43.

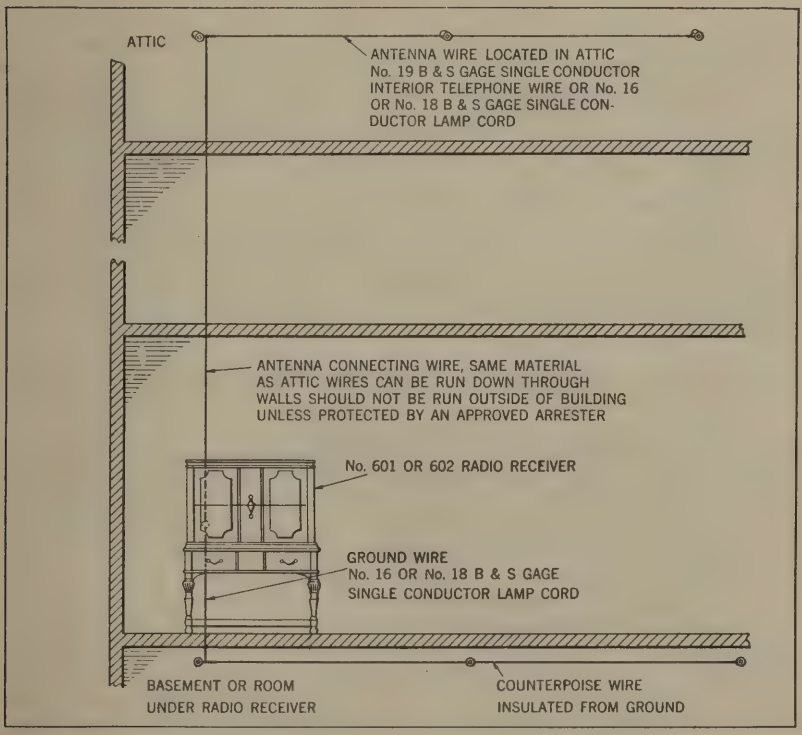


Fig. 45—A Counterpoise Wire used in place of a "Ground." Recommended for locations where the usual Ground collects "Electrical Noises."

Where none of the above ground connections are available, a good ground can be provided by driving a 6 ft. telephone ground rod or a 6 ft. length of galvanized iron water pipe into earth that will remain moist the year around. See Fig 40 for such a ground, which in this case is used for connecting to an outdoor antenna arrester.

A receiving set ground should never be made to electric light conduit, as high resistance joints prevent obtaining a good circuit to earth and electrical "noise" pickup can be expected.

A gas pipe should not be used as a radio receiver ground, as it has insulating joints placed between the gas jets and the point where the pipe enters the earth (ground). For this reason, the "National Electrical Code" prohibits the use of a gas pipe for an arrester ground connection.

The use of a common ground connection for the radio receiver and the arrester, as shown in Figs. 39 and 41, is not objectionable, provided a shorter and more convenient connection to a good ground is not available as illustrated in Fig. 40.

§ 35—USE OF A COUNTERPOISE GROUND

When the No. 601-B or 602-B receiver is located in such a position that a good ground connection, free from local "noise" pickup is not possible, then the next best scheme is the use of what is known as a "counterpoise." This is merely a length of insulated wire, such as No. 14 B. & S. gage rubber covered and braided copper wire, connected to the "GND" binding post of the receiver and stretched along the floor of the room or down a hallway for 30 feet or longer, as indicated in Fig. 45. This wire should not be connected to any metallic objects and the antenna should be any one of the types described in this instruction book.

With a counterpoise, the receiver may tune slightly sharper than when a ground connection is used. Also, it may be found advisable to set the lever of the key marked "ANTENNA" to position "2" for increased sensitivity, to make up for the loss of "pick up" over that of the ground system.

§ 36—INSTALLING A LOOP ON NOS. 601-B OR 602-B RECEIVERS

The No. 601-B and 602-B radio receivers are designed for antenna or loop operation, so as to fit all local receiving conditions. **The single wire antenna is the most efficient type of pick-up device and should be used wherever possible, as it will allow for greater amplification of a weak or distant signal and being non-directional, it does not require any manipulation when selecting broadcasting station programs.**

There are locations, however, where it is not convenient to install an outside antenna, or where an inside antenna wire will be shielded from the desired broadcast signal by its closeness to the metalwork in the building walls. In such cases, a loop type of pick-up that is located away from metal in the walls usually will be more satisfactory and can be employed on the Nos. 601-B and 602-B receiver as subsequently described.

In order to adapt the No. 601-B or 602-B receivers for loop operation, a Stromberg-Carlson No. 101-A Loop will be required. This loop comes complete with supporting bracket and connecting cable and is easily installed as follows:

First—The loop supporting bracket should be attached to the lower rear side of the cabinet with the two cap screws provided for this purpose. Holes "R" and "S" shown in Figs. 12 and 13 are provided for these two cap screws and a metal screw-plate comes already mounted inside of the receiver cabinets into which these screws will thread. Use a standard automobile type socket wrench for ½ inch hexagonal heads or a Stevens "Spintite" No. 8 Socket Wrench for tightening these bracket mounting screws.

Second—After mounting the loop supporting bracket, the loop can be set in place in the socket, provided in the end of this bracket, by first threading the loop conecting cable down through the socket opening. Fig. 46 shows the loop mounted on the No. 601-B receiver while Fig. 47 shows the mounting on No. 602-B receiver.

Third—The loop conecting cable now should be threaded through the opening "T" Figs. 12 and 13, provided in the back panel of the cabinet and the three conductors attached to the chassis

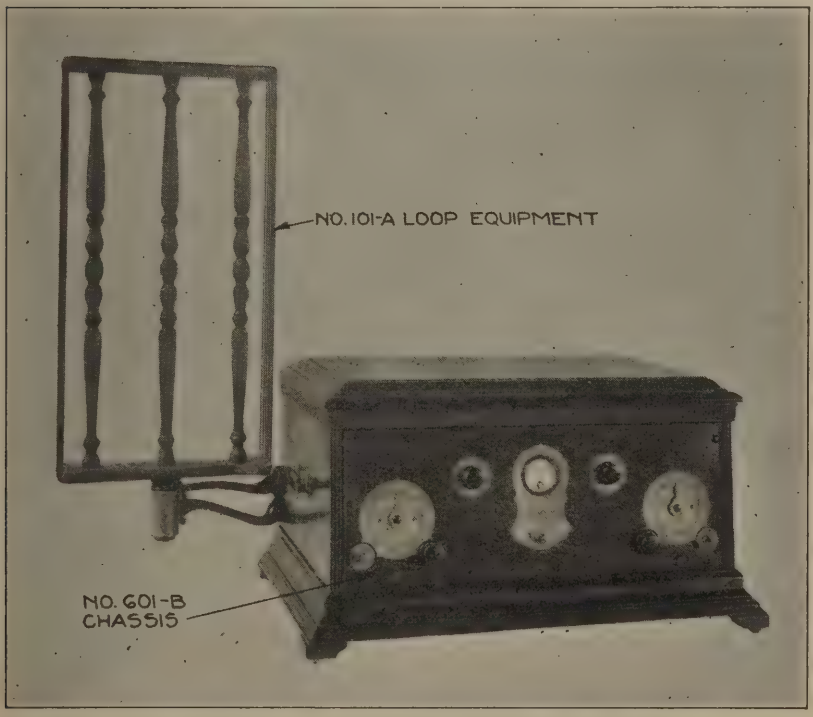


Fig. 46—Loop Type of Signal Collector applied to No. 601-B Receiver

binding posts as shown in Fig. 48. The wires are plainly labeled and are color-coded as follows:

Black Loop wire, connect to binding post marked "GND."

Black and Blue wire, connect to binding post marked "LOOP-2."

Blue wire, connect to binding post marked "LOOP-1."

The binding post marked "ANT" is not used and a ground wire is generally not necessary.

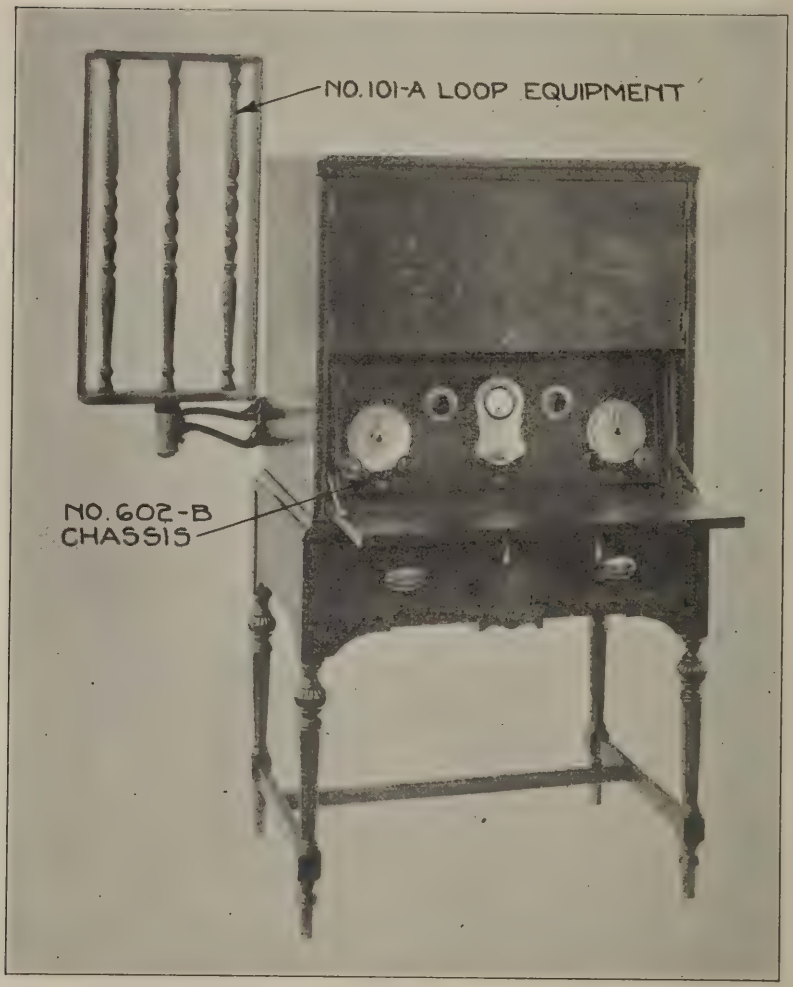


Fig. 47—Loop Type of Signal Collector applied to No. 602-B Receiver

Fourth—The No. 601-B or 602-B receiver circuits are converted for loop operation by merely pulling up the black switch handle, projecting through the top of the left hand shield (Fig. 49) to the position where the letter "L" is fully exposed. (When this same handle is depressed so that the letter "A" only is exposed, the receiver is arranged for antenna operation).

§ 37—OPERATING NOS. 601-B OR 602-B RECEIVERS WITH A LOOP

All of the installing and operating instructions contained in this book apply to the loop equipped No. 601-B and 602-B radio receivers excepting that the key marked "ANTENNA," see Fig. 1, is not used when the receivers are connected for loop operation.

The best location of a loop receiver for picking up broadcasting station signals is dependent on local conditions, such as the presence of large metal surfaces, radiators, piping, metal lath or wiring in the walls of the building that may absorb some of the energy of the radio waves. Thus, it is advisable to determine the best location by comparing the operation of the loop equipped receiver in different parts of the room.

Usually the best results are obtained when the receiver is located near a window or closer to the outside walls of the building than the inner walls.

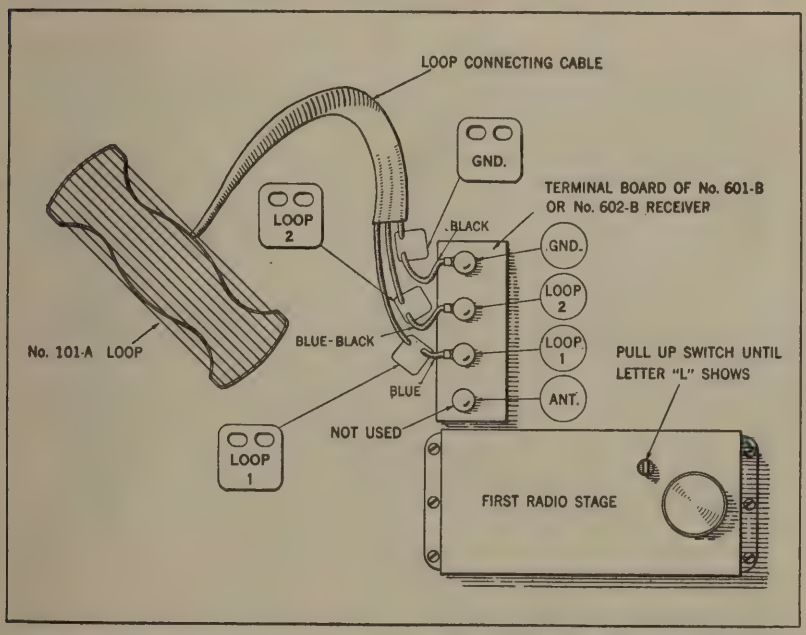


Fig. 48—Wiring of Loop Cable to Receiver Chassis Binding Posts

When selecting stations with the loop equipped receiver, follow the detailed instructions given in Sections 8, 9, 10 and 11 of this book, omitting the operation of the "ANTENNA" key, which is not used. If the desired stations are not heard, when operating the STATION SELECTORS, then rotate the loop a quarter of a turn from its former position, and repeat the tuning operations.

Under normal conditions there are two positions of the loop at which the signal strength will rise to maximum for each transmitting station, also two other positions at right angles where the signal will be at a minimum.

In some cases, this selectivity of the loop can be used to advantage in cutting out an undesired local or powerful broadcasting station, or a local electrical disturbance and still bring in a desired station. **The loop should be rotated to the position where the best results are secured, endeavoring to locate the position where the interference does not come in, but the desired signals do.**

It is obvious from the foregoing that the rotated position of the loop can be used as a second means for reducing the volume of signal in the loud speaker, thus one or both of the following methods can be used:

(a) By using the "VOLUME CONTROL" knob.

(b) By rotating the loop Figs. 46 or 47 to the best position for the desired volume of signal.

§ 38—INSTALLATION FOR BOTH ANTENNA AND LOOP

The loop switch, located in the 1st radio amplifier shielded compartment, is so wired that either an antenna or a loop can be connected to the receiver circuit as desired, but in no case can both of these collector systems be connected at the same time.

This makes it possible to permanently connect an antenna wire to the "ANT" binding post and a ground connecting wire to the "GND" binding post and at the same time install a loop as previously described in Section 37 and as shown in Fig. 51. Now, by merely setting the switch handle to "L" as shown in Fig. 49 or to "A" as shown in Fig. 50, the loop or the antenna are connected to the receiver as desired.

When these two collector systems are both wired to the binding posts of the receiver, it will be found that the loop may act different than when no antenna or ground wires are installed. In other words, one side of the loop may be more strongly directional than the other side and instead of revolving the loop one-half a revolution (180°) for obtaining maximum pick-up, it may be necessary to revolve the loop nearly a complete revolution (360°) to locate the position for maximum signal.

The operation of the No. 601-B or 602-B receivers when wired for both loop and antenna systems, but with the loop switch, set at "A" Fig. 50 for antenna operation, follow the instructions given in this book for receivers equipped with antenna only. In this case, the presence of the loop does not interfere or modify the action of the antenna operation.

When the loop is used (with antenna and ground connected to the receiver binding posts) the ANTENNA key should be set at the position **that gives greatest selectivity.**

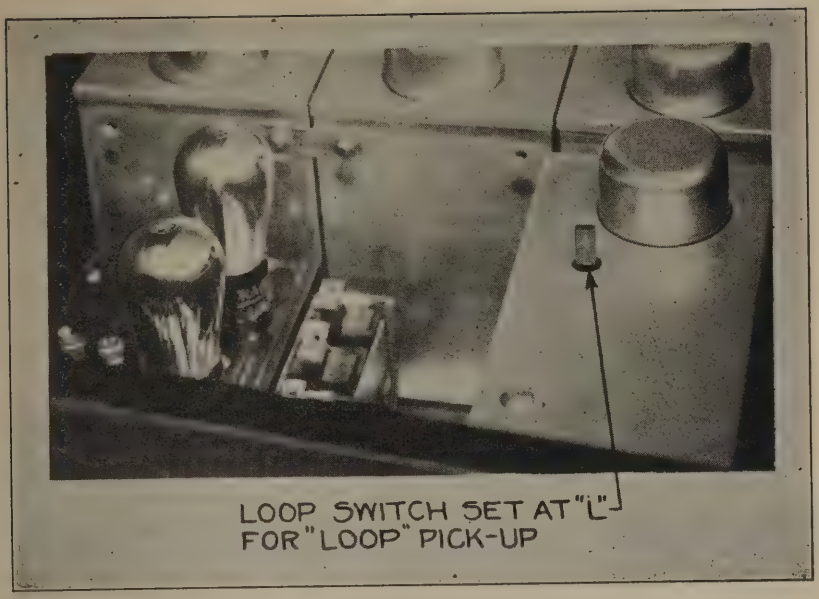


Fig. 49—Loop Switch in 1st Radio Shield, Set for Loop Service "L"

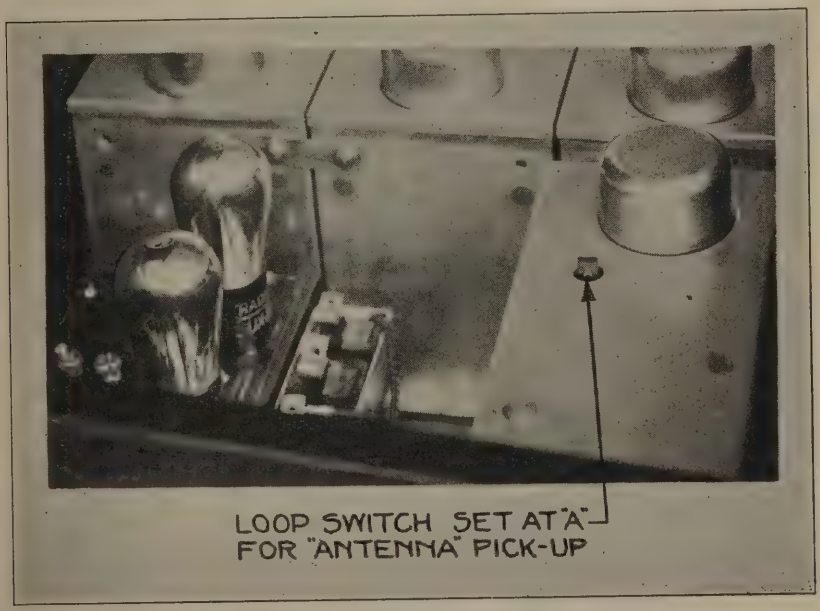


Fig. 50—Loop Switch in 1st Radio Shield, Set for Antenna Service "A"

§ 39—PRECAUTIONS WHEN USING A LOOP

1—Use only the Stromberg-Carlson No. 101-A Loop, mounted on the bracket supplied with the loop.

2—Be sure to connect the loop conductors to the receiver binding posts as indicated in Figs. 48 or 51.

3—Handle the loop with care when installing, preferably holding it by the middle spindle and avoiding stretching or otherwise damaging the wires or connecting cable.

4—When revolving the loop, turn by taking hold of the middle spindle, keeping the hands away from the wires or connecting cable, to avoid detuning through "body capacity."

5—Always rotate the loop to obtain best results for selectivity and signal volume for each station tuned-in.

6—It has been found in practice that the signal waves from any particular broadcast station do not always come from the same direction, and this condition may gradually change during the reception of one program. Thus, it is advisable to test the position of the loop, when the signals fail to come through with the customary volume.

7—When the loop equipped receiver is located in a modern apartment building or other building with steel structure and metal lath work in the walls, it will be found that the loop usually points directly towards the nearest wall of the room for maximum signal pick-up.

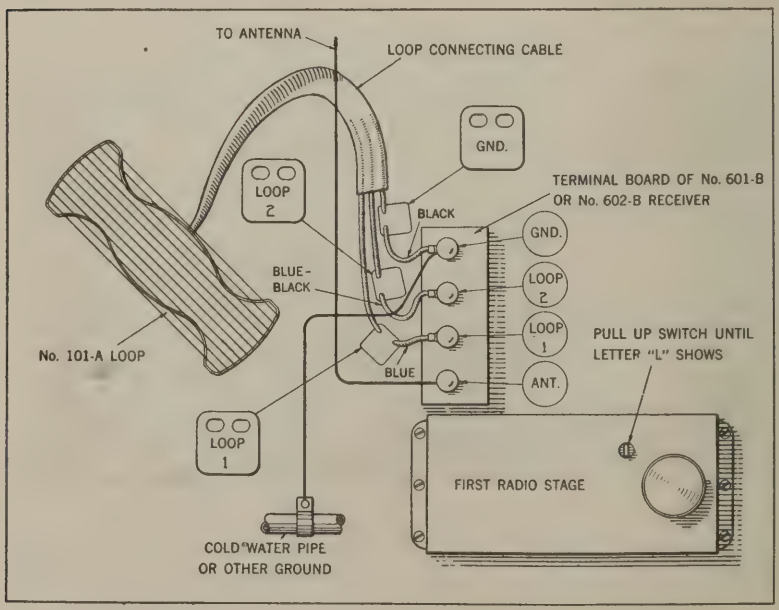


Fig. 51—Receiver wired for both Antenna and Loop Service

This is due to the fact that the magnetic waves from the broadcast station enter the window, or other outside opening, and follow the inner contour of the room walls.

8—Determine the best location for the loop equipped receiving set by trying the reception when placed in different positions in the room in which it is to be installed.

9—It is not to be expected that a concentrated loop type signal collector on this 6-tube receiver will be as efficient in picking-up and amplifying extremely weak signals (on very distant stations) as a 60-foot outdoor antenna. To obtain the latter results additional stages of amplification (additional radio amplifier tubes) would be required when the loop is used.

§ 40—HOME SERVICING OF RECEIVERS

Barring accidental damage in shipment or in handling, the No. 601-B and No. 602-B radio receivers will operate correctly when installed in accordance with the instructions contained in this book, providing the accessories, such as tubes, batteries and loud speaker are in good working condition. If the receiver should fail to operate correctly when first installed or at any later date, the following condensed list of possible reasons for the failure should be investigated and the "Special Service Instructions" followed to provide a suitable remedy:

(a) **No Signal in Loud Speaker**

(1) Battery Switch not turned to "ON"
(2) Station Selectors not set correctly.
(3) Defective tube or tubes.
(4) Loop-Antenna Switch not set correctly for type of pick-up used.
(5) Poor "A" or "B" battery connections.
(6) Tube not making contact in socket.
(7) Antenna or ground connections open or antenna grounded.
(8) Short circuited lighting arrester.
(9) Defective "A" or "B" battery connections.
(10) Defective or run down batteries.
(11) Incorrect battery connection.
(12) Defective loud speaker or head set.
(13) Loop in wrong position to receive station desired.
(14) Volume control not turned up.
(15) No station broadcasting.
(16) Loud speaker or head set not connected.

(b) **Weak Signal in Loud Speaker**

(1) Station Selectors not set correctly.
(2) No nearby or powerful broadcasting stations operating.
(3) Volume control not turned up.
(4) "A" Battery discharged so that voltmeter will not read 5 volts.
(5) "A" Battery connections reversed.
(6) "B" Battery incorrectly connected.
(7) "B" Battery run down to below 36 volts for 45 volts block.
(8) "C" Battery connections reversed.
(9) "C" Battery run down.
(10) Poor circuit connection in antenna or ground circuit.

(11) Antenna poorly insulated from supports, trees or buildings.
(12) Antenna shielded by steel buildings, metal lathing or damp brick walls.
(13) Tubes not up to full efficiency.
(14) Loop pointed in wrong direction.
(15) Loop antenna switch in wrong position.
(16) Tube not making contact in socket.
(17) Loud speaker incorrectly adjusted or connections reversed.

(c) Noisy Reception in Loud Speaker

(1) Trouble at Broadcast Station.
(2) Loose or corroded joints in battery connections.
(3) Loose joints in antenna or ground circuits.
(4) Unavoidable noise picked up by antenna.
(5) "C" Battery connections open or loose or run down "C" battery.
(6) Broken or defective Loud Speaker cord or connections.
(7) Microphonic detector tube.
(8) Defective tube or tubes.
(9) Poor or loose contact of tube in socket.
(10) Antenna poorly insulated.
(11) Loose connections of battery cable to terminal board in receiver.
(12) Loose connection of loop connecting cable to binding posts in receiver.
(13) Run down or defective "B" battery.
(14) Acoustic coupling between Loud Speaker and receiver.
(15) Volume control set too high.

(d) Signals Not Clear

(1) Defective Loud Speaker or Speaker incorrectly adjusted.
(2) Acoustic coupling of Loud Speaker to set, shown by one or more musical notes unduly accented or prolonged.
(3) Station Selectors not set at maximum response for desired station.
(4) Volume control set too high, thus overloading tubes or loud speaker.
(5) Received signals of poor quality.
(6) Heterodyning or squealing of two stations or radiating receivers.
(7) Run down "B" Battery.
(8) Run down "C" Battery.

(e) Inability to Tune Out Undesired Stations

(1) Antenna longer than 80 ft. including lead-in wire. Try a 20 or 30 ft. antenna.
(2) Station selectors not tuned to maximum response for desired station.
(3) Long or high resistance ground connections.
(4) Transmission from nearby powerful broadcast station broadly tuned.
(5) Two stations with wave lengths so close together as to allow overlapping of signals.

§ 41—SPECIAL SERVICE INSTRUCTIONS

The following paragraphs give servicing hints that will be of assistance to the owner who wishes to look after his own receiver installation:

1—**Incorrect Tuning:** In order to receive maximum clarity and best tone quality, station selectors must be set at the point of maximum signal strength for the desired station. Do this with the "Volume Control" turned down so as to get a sharp indication of the peak response. See Sections 8 and 13.

2—**Incorrect Connections:** Care should be taken that the batteries or Socket-Power connections are all according to the correct circuit diagrams in this Instruction Book. The receiver will not operate correctly unless the leads are connected to their correct voltage and polarity. Check carefully. See Figs. 3 to 8, inclusive.

(a) If the "A" battery leads are reversed, signals will be considerably weakened and the voltmeter on the front of the receiver will not indicate correctly (will point in the wrong direction). These connections should also be checked carefully with the wiring diagrams, Figs. 3 to 8, inclusive.

(b) If the "B" battery leads are reversed so as to give voltages at the receiving set terminals that are different from that specified on the binding posts, see Figs. 3 to 8, inclusive, the reproduction may be weak, distorted or unstable. Follow the color code and indicating tags in the circuit diagrams and check the connections at both ends of the battery cable. Refer to Section 15.

(c) If the polarity of the "C" battery is reversed, the signals will be very weak. These connections should be carefully checked with the wiring diagrams, Figs. 3 to 8, inclusive.

3—**Loose Connections:** All connections should be carefully checked to make sure that they are tight. Connections between two wires should be soldered wherever possible, and the bare conductor completely covered with insulating tape.

4—**Corroded or Dirty Terminals:** The storage battery terminals sometimes become corroded and this corrosion may extend to the connecting wires, so that poor contact is made. These terminals and the wire should be cleaned off. "Household Ammonia" may be used in cleaning the terminals. Vaseline should be put on the terminal to prevent recurrence. Poor connections are sometimes caused on any battery by dirt or some foreign material getting between the terminal of wire and binding post. Clean carefully.

5—**Battery Cable Terminals:** The terminals of the battery cable should be tightly held under the thumb nuts of the binding post of the terminal board of the receiver. Tighten these connections by using a silver 25 cent coin as a screw driver, inserted in the slot in the thumb nut.

6—**Voltmeter Reading Low:** If the "A" battery is not charged high enough to operate the radio receiver efficiently, the voltmeter pointer (Fig. 18) will not indicate 5-volts when the VOLTAGE CONTROL knob is turned as far in the direction of the arrow as possible. If the "A" battery leads are made longer than the

connecting cable, furnished with the receiver, or if made of too small a size of wire, the voltage drop in them, when the set is turned on, will be so great as to prevent the full 5-volts across the filaments of the tubes. This is indicated by the impossibility of obtaining a reading of 5-volts on the voltmeter even though the battery is fully charged and the VOLTAGE CONTROL knob is turned to the maximum (direction of arrow).

7—**Poor Contact in Tube Sockets:** If the prongs of the vacuum tubes are corroded or dirty, they will not make good contact with the springs of the tube sockets. Remove the tubes and scrape the tube prongs clean. If this does not help, the socket springs must be readjusted by someone equipped with tools designed for this purpose.

8—**Grounded Antenna:** If the antenna is accidentally grounded, indicated by broad tuning on the left hand station selector and the weakness of the received signals, trace out the antenna lead and make sure that its installation is perfect where it runs along walls and through partitions and at its supports. If the trouble is not located, disconnect the antenna lead-in from the arrester and connect through directly to the receiver "ANT" post, so as to omit any connection of the antenna to the arrester, and re-test the receiver. If it now works correctly, the lightning arrester is defective and should be replaced by a new one.

9—**Swinging Antenna:** The antenna installation should be carefully inspected making sure that the antenna or lead-in does not swing against trees, buildings, etc.

10—**Poor Connections in Antenna-Ground System:** Antenna or ground wires when spliced or connected to ground clamps, etc., should be soldered whenever possible. In any case, a good firm, clean contact is necessary.

11—**Inefficient Ground Connections:** The ground connection should be as short as possible to a cold water pipe or other good ground (Section 34). If the ground lead is long or is connected to a system of steam or similar pipes, it is liable to be high resistance. Noisy reception will generally result. Try using a wire as a "counter-poise," as suggested in Article 35. Inspect the ground clamp (if used) for tightness and for presence of dirt or paint between clamp and pipe.

12—**Defective Tubes:** Tubes may be defective in several ways. There may be an inter-element short circuit or the filament emission may be low. Check tubes by exchanging them, one at a time, with a tube that is known to be good. If one tube is found to be poor or defective, check the rest carefully again so as to be sure that there are no more. Sometimes the vacuum tubes can be damaged by rough handling so that the filament becomes broken or the elements of the tube short circuited. See Articles 23 and 24.

13—**Acoustic Coupling:** If a steady howl is given by the loud speaker, but not by a head set when plugged in, try moving the loud speaker in various positions in the room, keeping it well away from the receiver, also follow the directions concerning microphonic detector tubes in Section 25.

14—**Incorrect Connecting of Loud Speaker:** If some loud speakers are not "poled" correctly with respect to the "B" battery in the receiver, the signals will be much weaker. Check the connections of the loud speaker with the loud speaker binding post on the terminal board of the receiver, and if the terminals of the loud speaker are not marked or the cord is not color-coded, try reversing the terminals of the cord in the binding posts, using the connection that gives the greatest volume of signal. If one of the binding posts on the loud speaker is marked "+" this post should be connected to the binding post on the radio receiver terminal board marked "SPEAKER +."

If the loud speaker is furnished with a cord having a color designation, then the conductor designated by either a **red thread tracer** or by a **solid brown coloring** should be connected to the radio receiver binding post marked " SPEAKER +."

15—**Incorrect Adjustment of Loud Speaker:** If the signals sound badly distorted or the loud speaker seems to rattle, the speaker should be adjusted according to the maker's instructions. See Section 47 for information covering the Stromberg-Carlson No. 5-A Cone Type Speaker.

16—**Defective or Worn Out "B" Batteries:** It sometimes happens that a new "B" battery may be defective and have very low or zero voltage. This will make the signals very weak or lacking entirely or cause the cone speaker to rattle. To determine whether this condition exists, each block of "B" battery should be checked by a voltmeter, when installed to make sure that they are up to maximum voltage (See Article 18 on the subject of "Plate or 'B' Battery").

17—**Defective or Worn Out "C" Batteries:** A worn out or defective "C" battery usually is indicated by the failure of the loud speaker to give a good clear tone (or freedom from rattle) on a medium volume of signal, when listening to a local broadcast station. Good, fresh "C" batteries should last fully 6 months in the Nos. 601-B and 602-B radio receivers. "C" Batteries should be replaced when "B" Batteries are changed. (See Section 19).

§ 42—INTERFERENCES AND DISTURBANCES

Disturbances that interfere with the clear reception of broadcast programs can be due to two causes:

First—Noises that are generated in the radio receiver circuit.

Second—Noises that are generated outside of the radio receiver and that are picked-up by the antenna or loop and amplified, along with the desired broadcast signals.

The Stromberg-Carlson Nos. 601-B and 602-B radio receivers completely avoid all noises usually generated in the receiver itself by the special balancing of the circuits and the use of complete shielding over the individual radio amplifier and detector stages. Incorrect operation of the receiver, in no case, will generate noises that will radiate from the antenna or loop and interfere with neighboring receivers.

However, noises that are caused by natural "static," locally used electrical appliances and neighbors' radiating receivers, and collected by the antenna or the loop, naturally are magnified or amplified by the

radio receiver, along with the desired signals, and are heard in the loud speaker. The sole function of any radio receiver is to amplify, without distortion, all of the signals that are tuned-in at any particular wave length or frequency. It is not possible to "sift" out these "noise" frequencies as most of them are of the same character as the frequencies of the desired signal.

It is obvious that the eliminating of these disturbances must be by either one or both of the following methods:

(a) Eliminate or reduce the disturbance at its source.

(b) Locate or arrange the antenna or loop of the radio receiver, so as to be in a favorable position for picking-up the desired broadcast station signal and in an unfavorable position to collect local disturbing noises (See Article 43).

Unfortunately, it is not possible to remedy all of the disturbances at the source, but care in the installation of the pick-up usually will give a saisfactory installation for local stations and for most distant stations. The following is a list of disturbances and suggested remedies:

(a) **Interference Between Broadcasting Station Programs:** The "selectivity of the No. 601-B and No. 602-B radio receivers is ample to prevent this kind of interference, provided the antenna is not too long, and the station signals do not overlap. (See Article 29 covering "Choice of Antenna and Location").

(b) **Interference Due to Broadcasting Stations on Close Wavelengths:** When the broadcasting stations are operating on wave lengths that are so close together that the inaudible radio-frequency carrier waves combine to cause audible beat notes, the result is a steady squeal or howl of unvarying pitch. This seldom occurs unless one or both of the broadcasting stations are operating on an incorrect wave length, or when a very distant broadcasting station has an assigned wave length the same as or close to that of a local broadcasting station.

There is no remedy in the hands of the broadcast listener to entirely overcome this kind of disturbance, other than to listen to the station that comes in with the loudest signal and reduce the amplification by turning the "VOLUME CONTROL" knob counter-clockwise or to the point where the interfering note is practically eliminated. If both stations come-in with the same volume, there is no way to mitigate this type of interference, although the programs may be partially separated by careful setting of both "STATION SELECTORS" to "maximum response" for the station desired.

(c) **Radiation from Local Receiving Sets:** Practically all receiving sets, using the "regenerative" principle, and sets not provided with means to prevent "oscillation" act as miniature broadcast stations and radiate tuning and receiving noises, **when incorrectly operated.** These noises usually vary in pitch and sound like chirping of birds, howling and low pitched groans and can be picked up from a receiving set located many miles away. However, the louder noises of this character come from a neighboring receiving set. A correctly balanced "Neutrodyne" type of receiver will not radiate this kind of disturbance, regardless of how the "STATION SELECTORS are tuned, so that when all of the receiving sets in use are of the "Neutrodyne" or balanced type,

no disturbance of this kind will be possible. The Stromberg-Carlson No. 601-B and No. 602-B radio receivers do not oscillate or radiate when installed in accordance with these instructions, **therefore, will not cause disturbance to your nearest neighboring receiving set.**

The only remedy for this kind of disturbance is to suppress it at the source. A campaign of education has been inaugurated by radio clubs and various national radio associations to minimize and eventually eliminate this receiving set radiating disturbance. You can assist in this good work, by conferring with your neighbor.

(d) **Interference Due to Telegraph Code Signals:** Telegraph code signals, sounding like continuous dots and dashes, usually come from so-called "spark sets" and can be local amateur stations or local or distant commercial stations. Nearly all of the commercial stations are without the broadcast range and the amateur stations are gradually eliminating the "spark sets" or are working these sets on a schedule that avoids interference with evening broadcast programs.

The great selectivity of the Stromberg-Carlson No. 601-B and No. 602-B radio receivers reduces this kind of disturbance to a minimum.

(e) **Interference Due to Static:** All noises due to atmospheric electricity and local man-controlled electricity is commonly called "static." This disturbance sounds like a continuous roaring noise with occasional crashes and other varying or steady superimposed noises.

The atmospheric static is greater in summer than in winter and usually is more noticeable at night than in daytime. When the volume of the "static" exceeds that of the signal from the desired broadcast station, it is impossible for any radio receiver to bring-in the programs satisfactorily. Devices for eliminating "static" also eliminate signal frequencies that are absolutely necessary for high quality audio reception. The only remedy is to be content with programs that come in with greater volume than that of the "static." Always keep the VOLUME CONTROL turned down when the static level is high.

Other noises included under the heading of "Static" are caused by one or more of the following:

1—Switching-on and off of lamps and other electrical devices.
2—Electric flat irons with thermostatic heat control or loose plug.
3—Electric heating pad with thermostatic heat control.
4—Door bells and buzzers while being operated.
5—Electric vacuum cleaners.
6—Sewing machine motors.
7—Furnace thermostat motors.
8—Oil burners that use spark ignition (some types).
9—Oil burners operating motors.
10—Refrigerator motors or electric control.
11—Violet ray machines.
12—Ozonators.
13—Motors with sparking brushes.
14—Battery chargers of vibrating type and some electrolytic types.
15—Ignition systems on private home lighting plants.

16—Electric elevators using commutators.
17—Hum caused by some types of "B" Socket Power Units, having unsatisfactory filter system, or with magnetic coupling to audio apparatus of the receiver.
18—Bad contact in electric house lighting system switch, lamp socket, fuse or other connected device.
19—Electric sign flashers.
20—Electric street cars and electric railroads.
21—Electric smoke and dust precipitators.
22—Telephone exchange pole changers and ringing converters, if not protected by suitable shunting devices.
23—Induction from telephone and telegraph lines.
24—Some arc light systems.
25—Electric welding apparatus.
26—X-ray machines.
27—Static electricity produced by running belts.
28—Static electrical machines.
29—Stock tickers.
30—Electric furnaces of some types.
31—Motion picture projectors using arc lamps.
32—High voltage testing equipment.
33—Defective electrical power circuits and apparatus.

Fortunately practically none of the above listed disturbances (steady disturbances) are picked up by a receiving set located in a residence building, although they may be encountered to a more or less extent in steel frame apartment houses, stores and factory buildings. Thus a satisfactory demonstration of a sensitive and powerful radio receiving set is best made in the ultimate location rather than in a store or other salesroom.

If the No. 601-B or No. 602-B radio receiver is to be installed in a steel framed building, where the disturbing "static" is generated inside this metal frame work, the use of an outside antenna with a short length of lead-in wire between the radio receiver and the outside wall of the building usually will greatly reduce the effect of this locally generated noise.

(f) **Interference Due to Battery Noises:** Any noise that continues after the antenna and ground is disconnected from the receiver binding posts and the left hand STATION SELECTOR is set at "0" and the right hand STATION SELECTOR is set at "100," usually is due to loose battery connections, to run down "B" or "C" batteries or to "noisy" tubes. First, see that all battery wires are securely fastened at the battery binding posts or spring clips of the various batteries (A, B and C batteries) and at the radio receiver battery binding posts. Then if the noise continues when the "A" battery is fully charged, replace the "B" and "C" batteries with fresh, new batteries.

§ 43—HOW TO AVOID DISTURBING NOISES

It is a simple matter to check whether disturbing noises heard in the loud speaker are generated in the radio receiver or whether these noises are picked up by the antenna and simply amplified in the receiver along with the desired broadcast signal.

Disconnecting the antenna wire or ground connection and then tuning the receiver to resonance is not a safe check, for there is always a short length

of pick-up conductor (tuned by the left hand STATION SELECTOR) between the antenna binding post and first shielded compartment of the Nos. 601-B and 602-B radio receivers to act as an antenna for nearby electrical noises or for local powerful broadcast signals.

The correct test for internal generated noises is to **detune the receiver** by setting the left hand STATION SELECTOR at the "O" division and the right hand STATION SELECTOR at the "100" division and then turning the volume control to maximum (clockwise direction as far as the knob will go). The voltmeter pointer should be at the red line (5 volts) when this test is made and the A, B and C batteries should be fresh and all battery wires tightly held at the binding posts in radio receiver, as well as at the batteries.

Absence of noise, when making this test, is proof that any noise heard in the loud speaker when tuning-in a desired broadcast signal is due to a local electrical disturbance or to atmospheric static and not to faulty operation of the receiver.

If the antenna and ground are correctly installed, all batteries O. K., and battery connections tight, then careful tuning of the receiver will cut-down the outside noise to a considerable extent. A good rule to follow is:

> **Rule 1—Always keep the "Volume Control" knob turned down** (counter-clockwise) to the point where both "Station Selectors" tune sharply or to a point on the scale where a definite maximum loudness of signal is heard.

Now if greater volume of loud speaker signal is desired, the volume control can be slightly advanced, so long as the disturbing noise does not become objectionable. Keeping the volume control turned too high also overloads the detector and audio tubes, resulting in poor quality (rattling and hissing) of the signals.

The Nos. 601-B and 602-B receivers always tune more sharply on the left hand STATION SELECTOR when the ANTENNA key is set at position marked "1," thereby avoiding pick-up of undesirable frequencies. Thus another good rule to follow is:

> **Rule 2**—Always set the ANTENNA key at "1" for receiving local broadcast signals and only use at position "2" for distant weak signals, and then only when conditions are favorable and local noise is not too great.

When the noise heard in the loud speaker is due to a local electrical disturbance, it is best to determine the source and make corrections at that source (see Article 42). In many cases this is not possible, therefore the next best remedy is to so locate the antenna as to avoid picking up the disturbance. Follow this rule to avoid noise pick-up:

> **Rule 3**—Always locate the antenna so that it will be more exposed to the desired broadcast signal than to the local disturbing electrical "noise."

If the receiver is located in a steel frame building or in a building with metal lathing, and electrical "noises" are generated inside the building by motors or other electrical devices, then it is obvious that an inside antenna would be very unsatisfactory, due to its free exposure to the local "noises" and to the fact that it is shielded against the outside signals from the desired broadcasting station. Thus two more rules can be formulated:

> **Rule 4—Always locate the antenna as far away from local generated electrical "noises" as possible.**

Rule 5—Always locate the antenna outside of a shielded building when inside "noises" are present, so that as much of the pick-up wire as possible will be in a favorable position for collecting the desired broadcasting signals and so that this wire will be in an unfavorable position to collect the inside "noise."

When following the latter ruling to its limit, there should be no long stretches of lead-in wire between the outside antenna and the receiving set, as this wire will act as a pick-up for the inside "noises." Also the outside antenna wire is best located when its open end is at the greatest distance from the building or from the source of electrical noise.

In many cases the ground connection acts as a collector of "noise." This is particularly true when the ground wire is long or is attached to a heating system pipe with high resistance rusted joints between the point of attachment and moist earth. Thus a good rule to follow is:

Rule 6—Always make the ground connection to a cold water pipe where possible.

When a good ground connection, free from "noise" pick-up is not possible, then the next best scheme is to use what is known as a "counterpoise" (see Article 35). This is merely a length of insulated wire, connected to the ground binding post of the receiver and stretched along the floor or down a hallway for 30 feet or longer. It should not be connected to any metallic objects and the antenna should be as favorably located as possible to pick up the desired broadcast signal and so as not to pick-up the local "noise." With a counterpoise in place of a ground connection, the receiver will tune sharp and the key marked "ANTENNA" may have to be set in position "2" for increased sensitivity. It will be found that the increased amplification provided by the Nos. 601-B and 602-B receivers will give good results on a counterpoise "ground" where a standard 5-tube receiver would not produce sufficient volume.

Rule 7—A counterpoise "ground" should be used when a short length, low resistance connection to earth, that is free from "noise" pick-up, is not possible.

No doubt, the greatest cause for excessive noise pick-up is in the use of an antenna that is too long for the receiver. It must be remembered that the antenna is a part of the amplifying system of a receiving set installation, and the longer the antenna the greater the amplification possible. When the receiver has a great amplifying power within its circuits, the antenna need not be as long as when the receiver is of less amplifying power. Thus the three stages of radio amplification provided in the Nos. 601-B and 602-B radio receivers require a shorter length of antenna than is necessary for receivers having only two stages of radio frequency amplification.

In general, the total length of antenna, including the lead-in, should not exceed 80 feet of single wire for the Nos. 601-B and 602-B receivers. With powerful local broadcast signals, the total length of antenna might be cut down to less than 30 feet if it is located in a position to efficiently pick up the desired signals. Thus the following rule should be observed:

Rule 8—A short antenna (less than 30 feet long) should be used only when it can be located in a position to efficiently pick up broadcast signals and when there are no local disturbing noises to interfere with the reception.

Reducing the length of antenna will not always act favorably to prevent the picking up of "noise," for if the noise is local and confined to the building, then the shorter the antenna length the greater the amplification neces-

sary (increase of volume control in the receiver) to make up for loss in amplification due to the shorter antenna if the loud speaker volume for the desired broadcast signal be kept the same for each condition.

The turning-up of the volume control, to compensate for decreased antenna length, naturally will increase the amplification of the local noise to a greater extent than that of the desired broadcast signal as the portion of the antenna exposed to the local disturbance remains practically the same whether the antenna is of a long or a short length. Thus the following rule should be observed:

> **Rule 9**—Use a long antenna (keeping in mind Rules 2 and 10) for reducing the noise background in the loud speaker when the disturbing "noise" is local and close to the receiver.

When it is possible to get away from local "noise" conditions with the use of a fairly long antenna (not to exceed 80 feet, including lead-in wire), then it is preferable to use this longer antenna for the extra pick-up that is required for daylight reception. This longer antenna also is preferable for use in the country, as usually there are no local or powerful broadcasting stations to interfere (see Rule 10).

The length of antenna also is dependent on whether it is possible to have complete control of the loud speaker volume by means of the VOLUME CONTROL on the receiver without resorting to detuning the station selectors or unduly cutting down the tube voltage VOLTAGE CONTROL for reducing loud speaker volume when listening to the most powerful local broadcast station signals. Therefore, this gives another good rule to follow:

> **Rule 10**—The size of antenna should be limited to the length that will allow the most powerful broadcast signal to be tuned sharply to resonance (maximum response) on both station selectors and so as not to give too great a volume on the loud speaker when the volume control is turned fully down (counter clockwise).

The reason for this ruling is that detuning the station selectors, in order to cut down volume, always results in impairment of quality and promotes interference and noise pick-up. Also reducing the voltage on the audio tube filaments to less than 4½ volts (reading on voltmeter) for reducing of volume may result in poor quality of loud speaker reproduction.

In unfavorable locations, the use of a short antenna for local reception and a long antenna for distant with a switch to cut-in one or the other (see Fig. 41) will satisfy the radio fan who is after the maximum range that is possible with the Nos. 601-B or 602-B receivers and at the same time give full control of the amount of noise background that might be encountered, due to atmospheric changes throughout the year.

When the Nos. 601-B or 602-B radio receivers are installed in a location where an outdoor type of antenna is not possible, due to building restrictions and where the building or location is shielded against "capacity" type of pick-up, then the loop (magnetic type of pick-up) may be used as described in Articles 37, 38 and 39. This gives the following rule:

> **Rule 11**—When the location is unfavorable for an antenna pick-up system, the loop type of collector may be used to advantage.

Due to the completeness of the shielding of the Nos. 601-B or 602-B radio receivers, and to the careful design of the receiver circuits, the only "noise" that can reach the loud speaker is that actually picked-up by the antenna

or loop and amplified along with the desired signal. The powerful radio amplification provided in these receivers allows for many installation precautions against "noise" pick-up that could not be used with receivers of less amplification or with receivers having no shielding.

§ 44—SPECIAL INSTALLING PRECAUTIONS

1—Vacuum Tubes:

This receiver is designed to operate efficiently with genuine R. C. A. Radiotron tubes as specified in the section on "Vacuum Tube Requirements," therefore the operation of the set as to sensitivity, selectivity, volume and tonal quality depends upon using these tubes only.
Only the tubes with the "UX" push pin sockets can be used in the No. 601-B and No. 602-B Radio Receivers.

2—Ground Connections:

Never connect the Storage "A" Battery to a ground or have any ground connected to the receiver excepting to the "GND" binding post, as shown in the wiring diagram accompanying each receiver. Such other ground connections may result in short-circuiting the battery. If a battery charger of the "Uninsulated" type, that is, one which connects one side of the battery to the power line when charging, is used, the battery should be completely disconnected from the set before the charger is started. The failure to do this may result in burning out the vacuum tubes in the set.

3—Location of Loud Speaker with Respect to Receiver:

Usually the location of a loud speaker with respect to the No. 601-B and No. 602-B receivers has no effect on the correct operation of the receiver or loud speaker. The loud speaker, however, should not be placed on top of the cabinet, particularly if it is of the Cone type.

With the advent of high quality reproduction and loud signal volume, such as is possible with the No. 601-B and 602-B radio receivers, it has been found an advantage to locate the high quality (Cone type) loud speaker some distance away from the receiving set, so that the person selecting the stations and operating the VOLUME CONTROL can best judge the results. In most cases, a distance of 10 to 20 feet separation between the cone speaker and radio receiver is ample.

Another reason for this separating of the cone speaker and the No. 601-B or No. 602-B radio receiver is the preventing of "acoustic coupling" which otherwise can be of sufficient magnitude to cause a steady vibrating tone. This acoustic coupling is similar to the action of a telephone receiver when held against the mouthpiece of a telephone transmitter and is remedied as explained in Section 25.

§ 45—NEUTRODYNE LICENSE

The No. 601-B and No. 602-B radio receivers are of the Licensed Neutrodyne type. The Stromberg-Carlson Telephone Manufacturing Company is licensed by the Independent Radio Manufacturers, Inc., under the Hazeltine patents Nos. 1450080, 1489228, 1533853 and other patents pending to manufacture and market these Neutrodyne Radio Receivers.

A metal license plate bearing the serial number of the Radio Receiver is attached to each apparatus unit directly behind the first shielded radio amplifier stage (See Fig. 31). It is important that this plate is not removed as it serves as a means of identifying the particular radio receiver and is a part of the maker's guarantee of reliability.

When writing the manufacturer regarding your particular receiver, give the serial number as stamped on this license plate. For example, "SERIAL No. 66251" as illustrated in Fig. 52.

Fig. 52—License Plate attached to each Receiver Chassis, containing the Serial Number and Code Number of particular Receiver

§ 46—MAKER'S GUARANTEE

The Stromberg-Carlson responsibility does not stop at the point of sale. Your continued success with the No. 601-B or No. 602-B radio receiver is our best advertisement. Tell us as well as your friends regarding the fine tonal results obtained, also as to your good records for selectivity and distance. If you have any difficulties in operating that are not covered by this instruction book, give us the details and we will tell you how to overcome them. Each No. 601-B and No. 602-B radio receiver is covered by the following maker's guarantee:

> This Stromberg-Carlson radio receiver has been thoroughly tested and calibrated before leaving our factory and is fully guaranteed against defective material and workmanship. Should any defect develop within one year from date of purchase, it will be promptly remedied by us upon the return of such part or parts to our factory at Rochester, New York, transportation charges prepaid. In order that we may be in position to make good on this guarantee and keep you informed regarding new ways to make your radio receiver more useful, the purchaser should fill in and mail the return postal card, accompanying this receiver, promptly to us.
>
> STROMBERG-CARLSON TELEPHONE MFG. CO.,
> Rochester, N. Y., U. S. A.

This guarantee is contingent on the radio receiving set not being changed mechanically or electrically after leaving the factory and that the black wax seals on the four cover shields remain unbroken. The location of these seals and the design of the official seal that is applied at the factory is shown in Fig. 53.

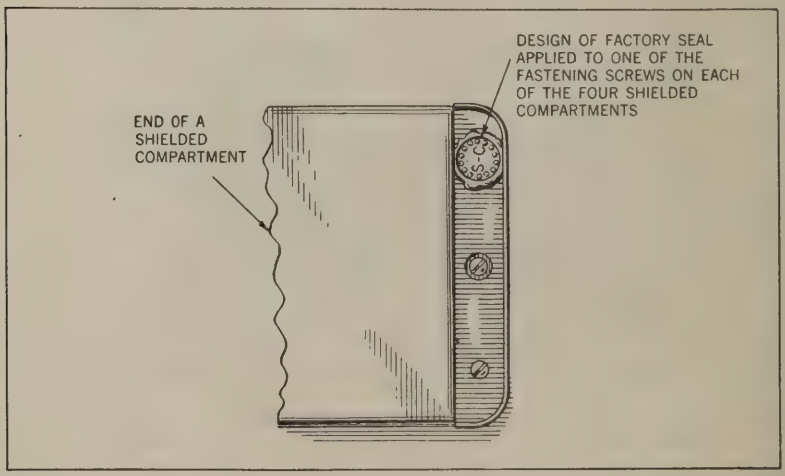


Fig. 53.—Design of Protecting Seal as applied to each of the four shielded compartments of a Receiver. The factory guarantee is contingent on these Seals remaining unbroken

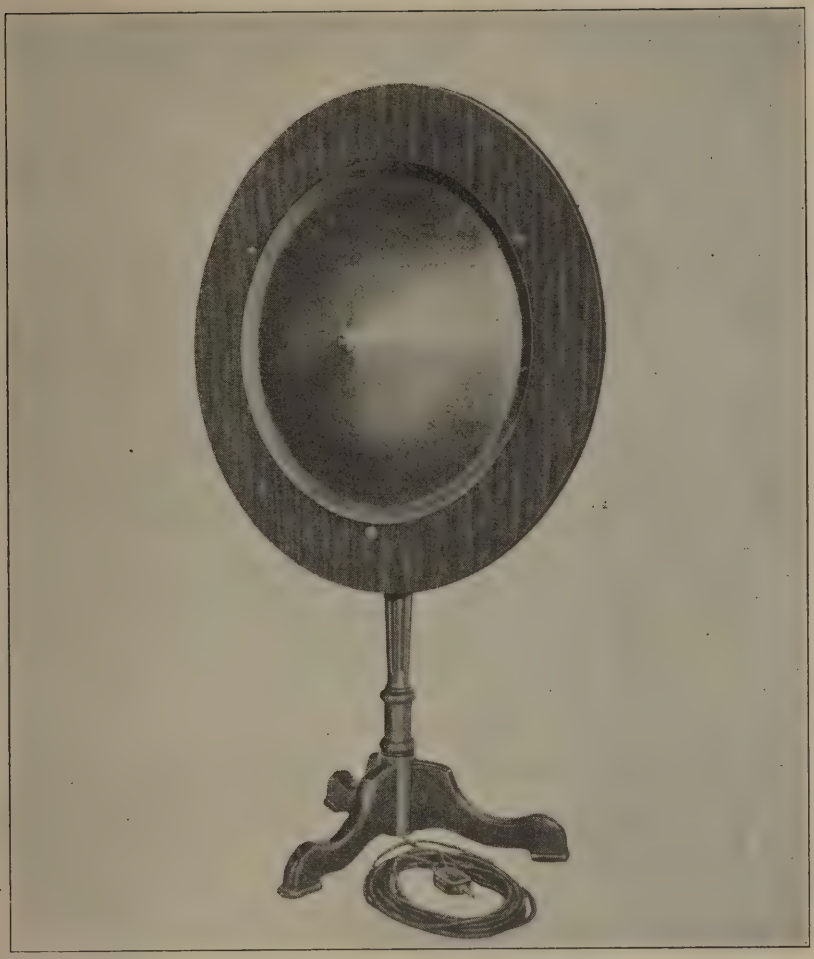


Fig. 54—Stromberg-Carlson No. 5-A Tip-Top Table Cone Speaker, furniture model design

§ 47—NO. 5-A CONE TYPE SPEAKER

The Stromberg-Carlson No. 5-A Cone Type Loud Speaker is designed especially for operation with the Nos. 601-B and 602-B radio receivers, and provides for the fine tone amplifying qualities that have been built into these receivers.

This loud speaker is made portable for convenience in placing in various locations in the room for best acoustical results and in particular, so that the Cone Speaker can be located to face the listeners and give natural-

ness of reproduction that is impossible when the sound comes from behind or from a built-in horn or cone in some out of the way permanent location.

In order to allow for this correct locating of the sound reproducer, the No. 5-A Cone Speaker is made in a neat furniture pattern to represent a small tip-top table with the top (cone and wood rim) permanently tipped to a vertical position as shown in Fig. 54 and is provided with a twenty foot cord for convenience in placing at a distance from the radio receiver.

When not in use, the No. 5-A Cone Speaker can be placed against the wall, in the corner of a room or any other protected and out of the way location. The finish and design is such that it will not detract from the finest room surroundings and being of the floor mounting type does not require table space with the usual mechanical or apparatus effect.

When in operation, the sound is projected in all directions, but in general the pointed end of the cone should face a group of listeners. When the volume is turned down for low or soft reproduction and the listener is fairly close to the cone speaker, it may be found that the sound is more concentrated (or focused) in the direction of the listener, when the cone speaker is turned around with the concave side toward the listener.

For a permanent installation to the radio receiver, it is advisable to remove the No. 60 plug from the end of the No. 5-A Cone Speaker cord and insert the cord tips into the binding posts marked "SPEAKER +" and "SPEAKER —" on the No. 601-B or 602-B receiver terminal board, shown in Fig. 35. This is particularly desirable in the case of the No. 602-B Art Console radio receiver. With this type of installation, the mere turning of the filament switch (Fig. 18) to "ON" connects the radio receiver and cone speaker for operation.

If at any time it is desired to temporarily connect a head set or separate loud speaker, the inserting of a plug, attached to either one of these devices, into the jack marked "PHONE" (Fig. 17) will automatically cut off the No. 5-A Cone type speaker that is permanently wired to the binding posts at the read of the radio receiver chassis, leaving only one sound reproducer in circuit at any one time.

As explained in Section 23 on "Vacuum Tube Requirements" the undistorted power output of the 2nd audio tubes vary, the larger the tube ouput the finer the tonal reproduction and the greater the undistorted volume from the No. 5-A Cone type speaker. In all cases it is advisable to use at least the power output of the UX-112 tube with the 135-volts of "B" battery and 9 volts of "C" battery for the "2nd Audio Amplifier" as shown in Figs. 3, 4 and 6. See Section 23.

Greater volume, without noticeable tube distortion (rattling, etc.) can be obtained with the UX-112 tube when used with a "B" battery voltage of 180 volts (4 blocks of large size dry cell "B" battery) and 13½ volts of "C" battery (3 blocks of "C" battery of 4½ volts each). In this case, it is advisable to use the Stromberg-Carlson No. 5-A Output Transformer wired as shown in Fig. 5.

The use of the UX-171 tube in the 2nd audio socket and with 135 volts of "B" battery and 27 volts of "C" battery with the No. 5-A Output transformer, as shown in Fig. 7, gives still greater loud speaker volume without tube distortion (rattling, etc.) than the previous arrangements.

For maximum undistorted volume output, either the Western Electric No. 6025-B Amplifier or the R. C. A. Uni-Rectron Amplifier model AP-935 should be used as shown in Fig. 8 and as described in Section 20 on "External Power Amplifier."

When one of these external amplifiers is used, the No. 5-A Cone Type Speaker should be connected to the "output" terminals of the amplifier, instead of to the receiver direct, as described in the last paragraph of Section 22.

Regardless of the amplifying system used or the type of high tonal quality loud speaker used, a harsh or rattling sound in the speaker, usually is due to one of the following causes:

(a) Volume Control turned up too high, causing tube to overload. Keep the volume down below the point where distortion becomes noticeable.

(b) Both Station Selectors not sharply tuned and Volume Control too high, as described in Sections 9 and 13.

(c) Low voltage in "B" or "C" batteries (worn-out or defective batteries). Occasionally a new dry cell battery may be defective when installed or become defective shortly after installation.

(d) Damaged Cone Speaker or central driving rod of Cone out of adjustment. To readjust, loosen the central thumb nut with the fingers and immediately re-tighten.

The following instructions cover the unpacking, setting-up and servicing of the No. 5-A Cone type speaker:

The No. 5-A Loud Speaker comes already connected to a 20 foot cord and a No. 60 Radio Plug and is ready for use as soon as the packing is removed.

In order to protect the operating mechanism, this loud speaker is packed with the small thumb nut on the front of the cone loosened. This nut is so designed that it will not completely unscrew and become lost, and it is recommended that this thumb nut always be loosened when moving the speaker from place to place. However, when ready for use tighten this thumb nut securely **with the fingers.**

Occasionally, it is advisable to loosen this adjusting nut for an instant and immediately retighten with the fingers, in order to compensate for expansion or contraction of the cone. This adjustment should be made also at such times when the loud speaker fails to operate satisfactorily.

Always operate with the volume control of the receiver **below the overloading point of the tubes,** otherwise the naturalness of the reproduction will be destroyed and a "rasping" or "rattling" effect will result. Defects in reproduction also result when the voltage of the batteries becomes too low or the "C" battery is defective.

Replacing the Cone: If at any time the cone is to be replaced, proceed in the following manner:

1—Loosen the adjusting nut at the center of the cone.

2—Remove the three screws in the three ends of the wooden spider at the rear of the speaker, holding the large wooden rim of the cone steady when the last two screws are removed, after which the cone can be carefully removed straight away from the small center driving rod. Care must be taken not to kink or bend this rod.

If the driving rod is accidentally bent or kinked, it can be readily straightened with a pair of flat nose pliers without damaging the driving mechanism.

3—Attach the new cone (P-16121) to the spider, with the same three screws used for holding the original cone, care being taken to see that the center driving rod enters the bushing at the apex of the cone and that the speaker handle or knob comes at the top. Just prior to inserting the center rod into the bushing of the new cone, insert the clamping nut assembly (P-16128), taken from the cone just replaced, into the center stud of the new cone, with the thumb nut at the top. A small piece of wire or the end of a wooden toothpick can be inserted into the center hole, from the front, to temporarily hold these parts in alignment until the driving rod enters the center hole of the cone from the rear, when this small piece of wire or toothpick will be pushed out. This will simplify the assembly operations, the center hole in the stud and the hole in the thumb clamp being held in alignment for the driving rod to center.

4—With the three cone attaching screws set just tight enough to hold the wooden rim from shifting, and the **center clamping nut loose**, apply a good loud speaker signal from a radio receiver. If the driving rod is corectly centered in the bushing of the cone, there will be a "buzzing" or "chattering" sound only and no speech or music from the cone itself. Move the wooden rim of the cone with respect to the ends of the wooden spider until a position is obtained that will give the buzzing or chattering sound, after which completely tighten the three cone attaching screws.

5—Now, tighten the thumb nut on the front of the cone firmly with the fingers, and the speaker is ready for operation.

Replacing the Cord: If at any time a cord is damaged and requires replacement, proceed as follows:

1—Remove the Cone as described in paragraphs 1 and 2, under heading "Replacing the Cone."

2—Disconnect the old cord terminals from the binding posts at the top of the operating unit, untie the strain knot and pull the cord out at the bottom of the wooden stand.

3—Insert the spade terminal end of the new cord (No. R-2-N-20 ft.) in to the hole at the bottom of the stand and pull out at the side hole in the spider with a button hook.

4—Tie a single knot in the body of the cord, about 6 inches from the terminals and pull this knot down against the hole in the spider.

5—Insert the two conductors of the cord between the magnet and the spider at the right hand side and bring the terminal ends over the top of the unit to the binding posts.

6—Insert the two spade terminals of the cord directly under the two thumb nuts of the two binding posts on the top of the unit, setting these nuts tight.

7—Replace the Cone as described in paragraphs 3, 4 and 5 of "Replacing the Cone," using a small piece of wire to hold the thumb nut clamping parts in position until the center rod has entered the bushing at the center of the Cone.

Location of Cone with Respect to Radio Receiver: A long connecting cord (approximately 20 feet) is supplied with the No. 5-A Loud Speaker to allow the sound reproducer to be placed a considerable distance from the radio receiving set for the following reasons:

(a) To allow for correct judging of volume when tuning the receiver.
(b) To allow the speaker to be located in the most convenient position in the room.
(c) To select a separation between the speaker and the radio receiver that will avoid "acoustic coupling." This is a steady tone that can occur when the detector tube is "microphonic" and is best remedied by selecting a non-microphonic tube for a detector (See Section 25).

The Stromberg-Carlson Company is licensed by the Lektophone Corporation, under patents Nos. 1,271,527 and 1,271,529 (other patents pending) to manufacture Cone Speakers.

§ 48—NO. 5-A AUDIO OUTPUT TRANSFORMER

This transformer is designed to insert between the output binding posts, marked "SPEAKER+" and "SPEAKER—," Fig. 11, and the loud speaker connecting cord terminals as shown in circuit diagrams, Figs. 5 and 7, and in power supply equipment layouts, Figs. 27 and 29. Its function is to prevent the direct current of the high plate voltage used for the second audio vacuum tube from reaching the loud speaker cord conductors and the loud speaker winding. The use of the No. 5-A Audio Output Transformer is recommended when plate voltages above 135 volts are employed on the UX-112 tube and for all installations in which the UX-171 tube is used. (See Section 23.)

The turns ratio of this No. 5-A Output Transformer is 1 to 1, the windings and core iron being selected to give efficient matching of the two connected circuits and to pass the large plate current of the UX-171 tube, which would be impossible if the circuit extended through the comparatively high resistance circuit of the loud speaker.

The connection of this output transformer to the Nos. 601-B and 602-B Radio Receiver output binding posts is made through a two-conductor cord that comes already attached to the transformer (See Figs. 5 and 7), the transformer unit being located in the "C" Battery tray in the chassis as shown in Fig. 32. The loud speaker cord should be connected to the binding posts marked "SPEAKER" on the top of this No. 5-A Output Transformer (the plug being first removed from the loud speaker cord).

It is not necessary to connect these loud speaker cord conductors with respect to polarity, as there is no direct current flow in this portion of the circuit when the output transformer is used.

When the No. 5-A Audio Output Transformer is employed, the use of a low pass filter, such as the Stromberg-Carlson No. 10-A Audio Filter, is not necessary and, in fact, usually will inetrfere with good reproduction.

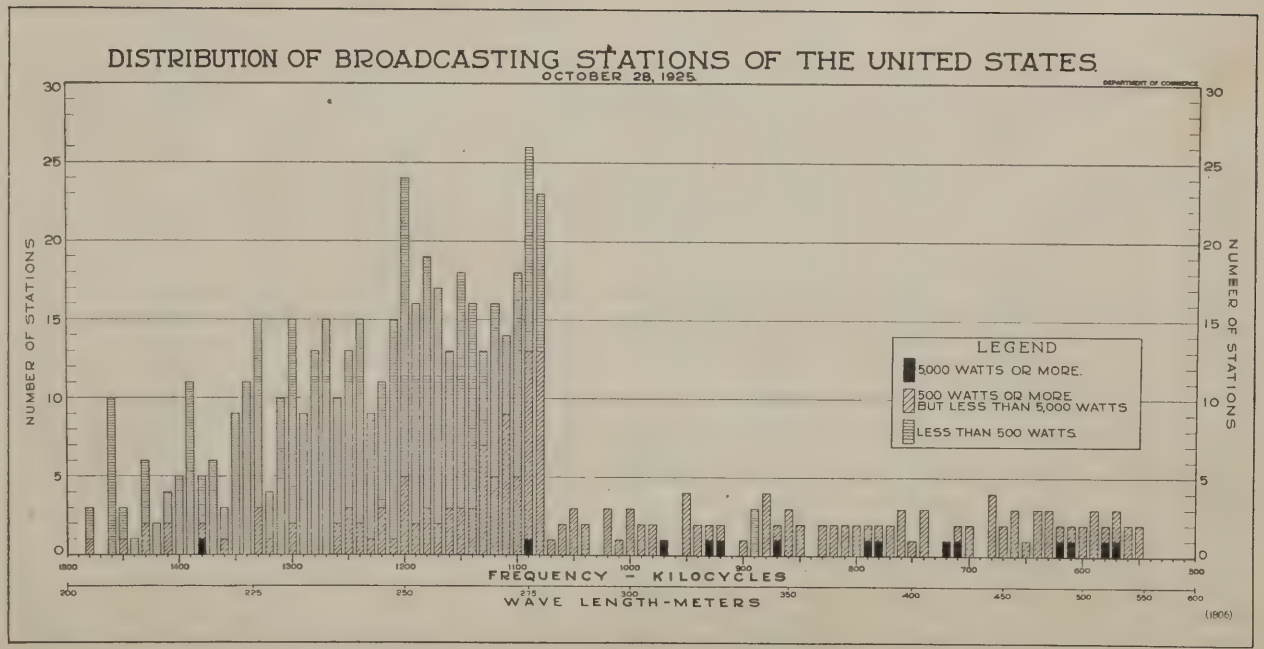


Fig. 55—Chart issued by the U. S. Department of Commerce, showing the number of Broadcasting Stations on each Channel. It is obvious that stations on Channels above 280 Meters (1070 Kilocycles) can be received with little or no interference between Stations on each Channel, and for Channels below 280 Meters that interference must be expected. Also see Fig. 19.

§ 49—LIST OF BROADCASTING STATIONS

Up until the time of the Fourth Annual Radio Conference, held in Washington, D. C., in November, 1925, under the auspices of the United States Department of Commerce, the continual monthly changes in the assignment of channels for broadcasting stations made it impractical to present a list of these stations in permanent form. At the November conference, the diagram shown in Fig. 55 was presented to members showing the assignment of broadcasting stations per channel and the power rating of the stations on each channel, as of Oct. 28, 1925. Due to the congestion and serious interference, especially in the lower wave length channels below 280.2 meters (1070 K. C.), the Department of Commerce has issued practically no additional broadcast station licenses. Thus, it is possible to present a partial list of broadcast stations that can be considered as fairly permanent.

In presenting this list, the stations below the wave length of 280.2 meters (1070 K. C.) have been omitted due to the fact that a large number of stations on each chanel may be broadcasting simultaneously, resulting in interference that is impossible for any radio receiving set to overcome. (See Section 42, paragraph "b"). On the other hand, the number of stations assigned to the channels above 280.2 meters (1070 K. C.) are limited to only one station broadcasting at any one time within the pick-up range of the average radio receiver. The only exception is when one station on the Atlantic Coast may broadcast on the same wave length and at the same time as a station on the Pacific Coast, but due to the big separation in distance, little or no interference should be experienced.

The No. 601-B and 602-B Radio Receivers are purposely designed to spread out these stations or broadcast channels that are limited as to time of broadcast so as to avoid interference, to a large section of the station selector dial, as indicated in Fig. 19. These stations are marked in this illustration as "Region of Restricted Stations."

Due to the fact that only a few of the local or most powerful stations in the low wave length channels, below 280.2 meters (1070 K. C.) can be brought in with any satisfaction, free from "whistling" and other station interference, only programs from nearby or powerful local stations in this band of wave lengths need be considered. In every locality there may be several stations in this portion of the dial marked "Interference Region" in Fig. 19 that can be selected with any degree of certainty. As a consequence the following list of broadcast stations covers only those assigned to the chanels between 280.2 meters (1070 K. C.) and 545.1 meters (550 K. C.) inclusive. However, space is provided for the addition of such stations as are of interest in any particular locality in which the receiver is installed. The wave lengths, call letters and other information covering these local stations usually can be found in the radio section of the local newspapers.

In this list will be found the wave length in meters, the frequency in kilocycles, the power output of the station in watts, the station call letters, the official location of the station and spaces for recording the exact station selector settings for such of these listed stations as are picked up by the owner of the receiving set.

It will be noticed that these stations are arranged in the list in the order of their wave lengths.

PARTIAL LIST OF BROADCASTING STATIONS

WAVE-LENGTH METERS	FREQ. IN K. C.	POWER IN WATTS	CALL LETTERS	LOCATION	SELECTORS		ANT. KEY	NOTES
					LEFT	RIGHT		
280.2	1070		KMOX	ST. LOUIS, MO.				
280.2	1070	500	WNAC	BOSTON, MASS.				
282.8	1060	500	WOAN	LAWRENCEBURG, TENN.				
282.8	1060	1000	WSM	NASHVILLE, TENN.	67	6		
285.5	1050	500	WEMC	BERRIEN SPRINGS, MICH.				
285.5	1050	1000	WKAR	EAST LANSING, MICH.				
285.5	1050	500	WREO	LANSING, MICH.				
288.3	1040	1000	WLWL	NEW YORK, N.Y.				
288.3	1040	2000	KFKX	HASTINGS, NEB.				
293.9	1020	500	WAIU	COLUMBUS, OHIO				
293.9	1020	750	KTBI	LOS ANGELES, CALIF.				
293.9	1020	500	WEAO	COLUMBUS, OHIO				
296.9	1010	500	KPRC	HOUSTON, TEXAS				
299.8	1000	1000	KSL	SALT LAKE CITY, UTAH				
299.8	1000	750	KUOA	FAYETTEVILLE, ARK.				
299.8	1000	500	WPG	ATLANTIC CITY, N.J.	10	12		
302.8	990	1000	WGN	CHICAGO, ILL.				
302.8	990	2500	WLIB	ELGIN, ILL.				

305.9	980	1000	KTCL	SEATTLE, WASH.				
305.9	980	500	WJAR	PROVIDENCE, R.I.				
309.1	970	2000+	KDKA	PITTSBURGH, PA.				
312.3	960		C---	CANADIAN STATIONS				
315.6	950	1000	KPSN	PASEDENA, CALIF.				
315.6	950	500	KFDM	BEAUMONT, TEXAS				
315.6	950	500	WAHG	RICHMOND HILL, N.Y.				
315.6	950	500	WGBS	NEW YORK, N.Y.				
319	940	750	WGR	BUFFALO, N.Y.				
319	940	500	WSMB	NEW ORLEANS, LA.				
322.4	930	5000	KOA	DENVER, COLO.				
322.4	930	1500	WJAZ	CHICAGO, ILL.				
325.9	920	5000	WSAI	CINCINNATI, OHIO				
329.4	910		C---	CANADIAN STATIONS				
333.1	900	2000	WBZ	SPRINGFIELD, MASS.				
336.9	890	500	KNX	HOLLYWOOD, CALIF.				
336.9	890	500	KFMX	NORTHFIELD, MINN.				
336.9	890		WJAX	JACKSONVILLE, FLA.				
336.9	890	4000	6-KW	TUINUCU, CUBA				
340.7	880	1000	KFAB	LINCOLN, NEB.				

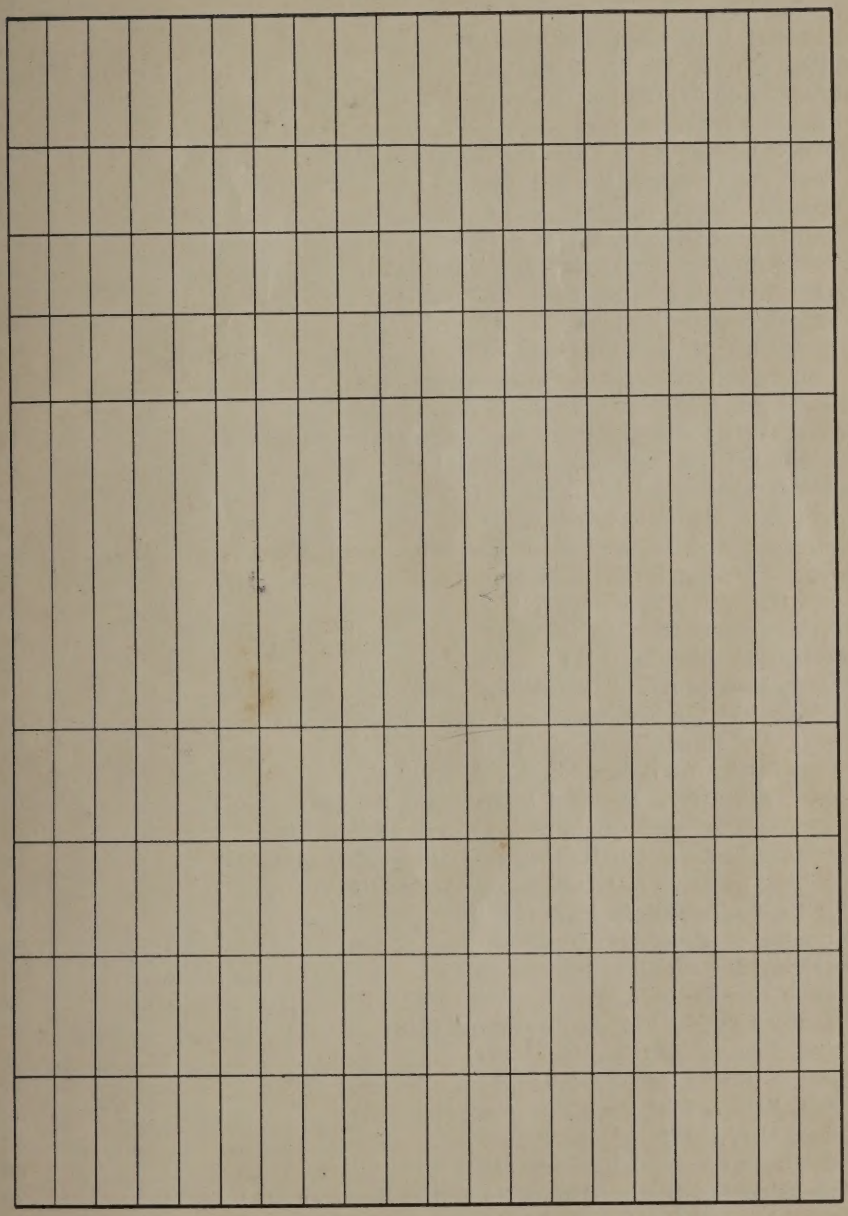
WAVE-LENGTH METERS	FREQ. IN K. C.	POWER IN WATTS	CALL LETTERS	LOCATION	SELECTORS		ANT. KEY	NOTES
					LEFT	RIGHT		
340.7	880	500	KSAC	MANHATTAN, KAN.				
340.7	880	500	WKAQ	SAN JAUN, P.R.				
340.7	880	500	WMCA	NEW YORK, N.Y.				
344.6	870	5000	WCBD	ZION, ILL.				
344.6	870	1500	WLS	CHICAGO, ILL.				
348.6	860	1000	KOB	STATE COLLEGE, N.M.				
348.6	860	500	KWSC	PULLMAN, WASH.				
348.6	860	500	WEEI	BOSTON, MASS.				
350	857	500	CZE	MEXICO CITY, MEX.				
352.7	850	500	WJAD	WACO, TEX.				
352.7	850	1000	WWJ	DETROIT, MICH.				
356.9	840		C---	CANADIAN STATIONS				
361.2	830	3500	KGO	OAKLAND, CALIF.				
361.2	830	500	WHN	NEW YORK, N.Y.				
365.6	820	500	WDAF	KANSAS CITY, MO.				
365.6	820	500	WHB	KANSAS CITY, MO.				
370.2	810	1000	WEBH	CHICAGO, ILL.				
370.2	810	500	WJJD	MOOSEHEART, ILL.				

374.8	800	500	KTHS	HOT SPRINGS, ARK.				
374.8	800	500	KVOO	BRISTOW, OKLA.				
379.5	790	5000	WGY	SCHENECTADY, N.Y.				
379.5	790	1000	WHAZ	TROY, N.Y.				
384.4	780	1000	KJR	SEATTLE, WASH.				
384.4	780	500	WMBF	MIAMI BEACH, FLA.				
384.4	780		C---	CANADIAN STATIONS				
389.4	770	1000	WEAR	CLEVELAND, OHIO				
389.4	770	3500	WTAM	CLEVELAND, OHIO				
394.5	760	500	WFI	PHILADELPHIA, PA.				
394.5	760	500	WLIT	PHILADELPHIA, PA.				
394.5	760	2000	WOAI	SAN ANTONIO, TEX.				
399.8	750	500	WHAS	LOUISVILLE, KY.				
399.8	750		WHT	CHICAGO, ILL.				
399.8	750	500	PWX	HAVANA, CUBA				
405.2	740	500	KHJ	LOS ANGELES, CALIF.				
405.2	740	1000	WJY	NEW YORK, N.Y.				
405.2	740	500	WOR	NEWARK, N.J.				
410.8	730		C---	CANADIAN STATIONS				
416.7	720	5000	WCCO	ST. PAUL AND MINNEAPOLIS } MINN.				

WAVE-LENGTH METERS	FREQ. IN K. C.	POWER IN WATTS	CALL LETTERS	LOCATION	SELECTORS		ANT. KEY	NOTES
					LEFT	RIGHT		
422.3	710	1000	WKRC	CINCINNATI, OHIO				
422.3	710	5000	WLW	CINCINNATI, OHIO				
428.3	700	1000	WSB	ATLANTA, GA.				
428.3	700	1000	KPO	SAN FRANCISCO, CALIF.				
434.6	690		C---	CANADIAN STATIONS				
434.6	690		NAA	RADIO, VA.				
440.9	680	1000	KLDS	INDEPENDENCE, MO.				
440.9	680	500	WDWF	CRANSTON, R.I.				
440.9	680	1000	WMAF	DARTMOUTH, MASS.				
440.9	680	500	WOS	JEFFERSON CITY, MO.				
447.5	670	500	WMAQ	CHICAGO, ILL.	40	9?		
447.5	670	500	WQJ	CHICAGO, ILL.				
454.3	660	1000	KFOZ	SEATTLE, WASH.				
454.3	660	1000	KTW	SEATTLE, WASH.				
454.3	660	50000	WJZ	NEW YORK, N.Y.				
461.3	650	500	WCAE	PITTSBURGH, PA.				
468.5	640	3000	KFI	LOS ANGELES, CALIF.				
468.5	640	500	WCAP	WASHINGTON, D.C.				

468.5	640	1000	WRC	WASHINGTON, D.C.				
475.9	630	1500	WBAP	FORT WORTH, TEX.				
475.9	630	500	WFAA	DALLAS, TEXAS				
475.9	630	500	WTIC	HARTFORD, CONN.				
480	625	500	CYL	MEXICO CITY, MEX.				
483.6	620	5000	WOC	DAVENPORT, IOWA				
483.6	620	500	WSUI	IOWA CITY, IOWA				
491.5	610	500	KGW	PORTLAND, OREGON				
491.5	610	5000	WEAF	NEW YORK, N.Y.				
499.7	600	500	KFRU	COLUMBIA, MO.				
499.7	600	500	WMC	MEMPHIS, TENN.				
499.7	600		C---	CANADIAN STATIONS				
508.2	590	500	KLX	OAKLAND, CALIF.				
508.2	590	500	WIP	PHILADELPHIA, PA.				
508.2	590	500	WOO	PHILADELPHIA, PA.				
516.9	580	5000	WCX	DETROIT, MICH.				
516.9	580	5000	WJR	PONTIAC, MICH.				
526	570	5000	WHO	DES MOINES, IOWA				
526	570	1000	WNYC	NEW YORK, N.Y.				
526	570	1000	WOAW	OMAHA, NEB.				

WAVE-LENGTH METERS	FREQ. IN K. C.	POWER IN WATTS	CALL LETTERS	LOCATION	SELECTORS		ANT. KEY	NOTES
					LEFT	RIGHT		
535.4	560	2000	KYW	CHICAGO, ILL.				
535.4	560	750	WHA	MADISON, WIS.				
545.1	550	500	KFUO	ST. LOUIS, MO.				
545.1	550	750	KSD	ST. LOUIS, MO.				
			WJZ					
			WLW					
			[illegible]					
			WFBM		2½	1		
			WTAM		16	14½		
			[illegible]		10	16½		
			WCAU Camden					



INDEX TO SUBJECTS